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SIRAHAMA, WAKAYAMA-KEN, JAPAN

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PELAGIC TUNICATES AND CHAETOGNATHS COLLECTED DURING THE CRUISES TO THE NEW YAMATO BANK IN THE SEA OF JAPAN*

TAKASHI TOKIOKA

With 12 Text-figures, 6 Tables and 1 Chart

The surveying ship of the Maizuru Marine Observatory visited in April, July and September 1950 the submarine New Yamato Bank in the Sea of Japan. Mr. I. YAMAZI of the Seto Marine Biological Laboratory and Mr. H. MAÉDA of the Kôbe University were on board in these cruises and hauled many plankton samples; and from these samples Miss Y. MORI of the Seto Marine Biological Laboratory picked up appendicularians and chaetognaths for me. Most of these plankton samples were collected from the superficial layer by a small cruise net, while a small part was hauled up from the deeper layer by KITAHARA's standard net, a modified HENSEN's net, with ca. 20 cm mouth diameter and ca. 1 m long. The former material comprises a small quantity of appendicularians and chaetognaths, while the latter material is very rich in these animals and has offered me several rare and interesting forms. All the data pertaining to these materials are given in the tables at the end of this article. In the following, I propose to give some systematic notes, and also the relation between the fauna and the hydrographical condition of the surveyed area.

Before going further, I wish to express my hearty thanks to Mr. I. YAMAZI, Mr. H. MAÉDA and Miss Y. MORI for their generous help. I am also very grateful to Prof. T. KOMAI for his kind guidance and incessant encouragement.

Contributions from the Seto Marine Biological Laboratory, No. 166.

* A part of the study progressed by the financial aid from the Ministry of Education.

I. SYSTEMATICALLY

A. PELAGIC TUNICATES.

The species found in the collection are as follows:

Ascidiacea: Tadpole larva

Thaliacea:
1. *Thalia democratica* FORSKÅL
2. *Doliolum* (*Dolioletta*) *nationalis* BORGERT

Appendicularia:
1. *Oikopleura* (*Coecaria*) *longicauda* (VOGT)
2. „ („) *fusiformis* FOL
3. „ („) „ f. *cornutogastra* (AIDA)
4. „ („) *gracilis* LOHMANN
5. *Oikopleura* (*Vexillaria*) *dioica* FOL
6. „ („) *rufescens* FOL
7. „ („) *parva* LOHMANN
8. „ („) *cophocerca* GEGENBAUR
9. „ („) *labradoriensis* LOHMANN
10. *Megalocercus huxleyi* (RITTER)
11. *Stegosoma magnum* (LANGERHANS)
12. *Pelagopleura* sp.
13. *Fritillaria* (*Acrocercus*) *haplostoma* FOL
14. „ („) *magna* LOHMANN
15. „ („) *formica* f. *digitata* LOHMANN & BÜCKMANN
16. „ („) *charybdae* LOHMANN
17. „ (*Eurycercus*) *pellucida* (BUSCH)
18. „ („) *borealis* f. *sargassi-intermedia* (LOHMANN) ....small individuals.
18a. „ („) *borealis* f. *sargassi* (LOHMANN) .....large individuals.
19. „ („) *tenella* LOHMANN
20. „ („) *venusta* LOHMANN
21. *Appendicularia sicula* FOL

An ascidian larva was obtained in Maizuru Bay. An aggregated form of *Thalia democratica* was found once among the July samples at St. 2. *Doliolum nationalis* occurred at the frequency of 36% in the vertical hauls. Among appendicularians, *Oik. longicauda* is the commonest, next come in frequency *Oik. fusiformis* and *Oik. rufescens*. *Frit. haplostoma*, *Frit. formica* and

Table 1. Population of pelagic tunicates. In six columns of the haul, the left sign indicates the frequency and the right one shows the quantity.
Frequency ● ··· 70 %+, ○ ··· 30–70 %, + ··· 30 %–.
Quantity ● ··· 30 individuals / a haul +,
○ ··· 10–30 individuals / a haul,
+ ··· 10 individuals / a haul –. (in offshore waters)

	April		July		September		Summary	
	Vertical haul	Superf. haul	Vertical haul	Superf. haul	Vertical haul	Superf. haul	Frequency	Quantity
Doliolum nationalis			○+	++	++		○+ +	++ +
Oikopleura longicauda	●●	●○	●●	○+	●●	●+	●●● ●●○	●●+ ●○+
〃 *fusiformis*			●○	●+	●○	●+	●● ●●	○+ ○+
〃 〃 f. *cornutogastra*			++		○+	++	○+ ++	++ +
〃 *gracilis*			++		○+		○ +	+ +
〃 *dioica*	○+	○+	++	○+	++		○○+ ○+	+++ ++
〃 *rufescens*			●○		●○	●+	●● ●	○+ ○
〃 *parva*			○+		○+		○ ○	+ +
〃 *cophocerca*			○+		○+	++	○+ ○	++ +
〃 *labradoriensis*	○+						○	+
Megalocercus huxleyi			++			++	+ +	+ +
Stegosoma magnum					++	++	+ +	+ +
Pelagopleura sp.						++	+	+
Fritillaria haplostoma			●+		●●	+○	●+ ●	●+ ○
〃 *magna*			++				+	+
〃 *formica*			●+		●+	++	●+ ●	++ +
〃 *charybdae*			○+		○+		○ ○	+ +
〃 *pellucida*			●○		●+	++	●+ ●	○+ +
〃 *borealis* f. *sargassi-intermedia*			●+	++	○+		●+ ○	++ +
〃 *tenella*			○●		●+		● ○	● +
〃 *venusta*			○+		○+		○ ○	+ +
Appendicularia sicula			++	++	++		++ +	++ +

Frit. pellucida were also met with frequently, but not in large number except the first one which were sometimes found in an enormously dense association in the coastal waters. As to the other species see Table 1 (p. 3).

The variation in size is an interesting item on the morphology of appendicularians, although we are still ignorant of the exact cause of the phenomenon. Among the present materials, *Oik. dioica, Frit. haplostoma* and *Frit. borealis* f. *sargassi* present such variation. It is noteworthy that individuals hauled at stations far off the coast are usually larger than those collected from the coastal waters; this is true at least for *Frit. haplostoma* and *Oik. dioica*. Specimens of *Oik. dioica* collected from the oceanic waters during the present surveys are all large, sometimes reaching 3.3 mm in tail length, and with the whole genital products ejected already. The specimens of *Frit. borealis* comprise large and small individuals of f. *sargassi* intermingled. Forma *intermedia* is represented only by small individuals and includes several specimens referable to f. *prolifera* LOHMANN in which the testis is forked anteriorly and embraces the ovary between.

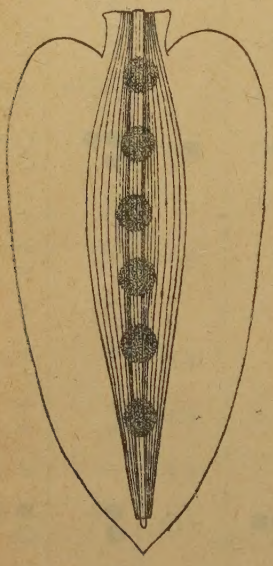

Fig. 1. *Frit. formica.* Tail with 6 pigment flecks.

It is well known that *Oik. longicauda* is occasionally coloured bright red or violet, while fritillarians is rarely coloured. Among the present materials, I met with two cases of colouring in fritillarians. The first case is of *Frit. pellucida* which is coloured reddish orange along the dorso-anterior margin of the hood and on the ventral surface of the anterior half of the trunk. The second case is of *Frit. formica* which is coloured reddish orange around the testis, besides six remarkable pigment flecks arranged in a row along the chorda of the tail (Fig. 1).

Some Taxonomic Notes on Appendicularia

(1) *Oikopleura fusiformis* f. *cornutogastra* AIDA (1907)

(Fig. 2)

In my 1940 paper, I expressed the opinion that *Oik. cornutogastra* AIDA

is merely a synonym of *Oik. fusiformis* Fol. Later (1942), however, in my paper dealing with the material collected from the waters surrounding the Palao Islands, I referred *Oik. cornutogastra* to a distinct species, although I knew the presence of some intermediate forms between this species and *Oik. fusiformis*. The present materials make me go back to my original view that *Oik. cornutogastra* cannot be considered as a distinct species. It is true that

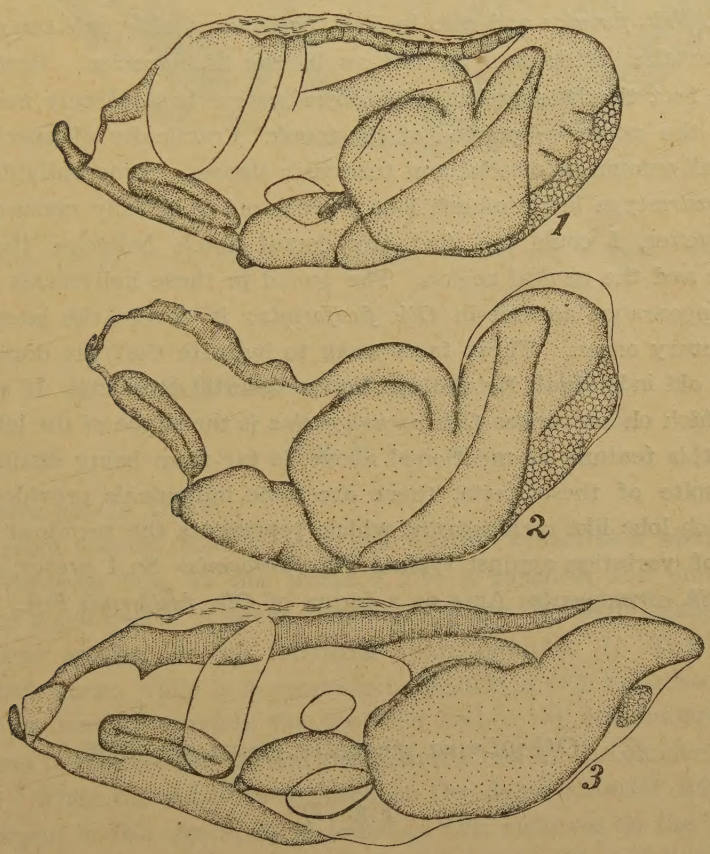

Fig. 2. *Oik. fusiformis*. 1—f. *cornutogastra* without dorsal notch; 2—An intermediate form with dorsal notch; 3—f. *typica*. ×110.

Oik. cornutogastra and *Oik. fusiformis*, as for the form of the cardiac protuberance of the left stomach lobe, are united by a complete series of intermediate forms. Thompson (1948) maintains as a characteristic of *Oik. cornutogastra* the existence of a notch on the dorsal side between the oikoplast epithelium and the genital region, where a curled velum may be formed from

a fold of the thin epithelium. This notch is found in many specimens. It should be noticed, however, that there are specimens which have the notch and the left stomach lobe of *fusiformis*-type, and also those having the left stomach lobe of typical *cornutogastra*-type, but no notch. In structure of the oikoplast epithelium and in the appearance of the tail musculature these two forms are identical. Slight differences in the measurement of the tail musculature cannot be accepted as a decisive specific difference, as there is a wide range of variation in the breadth of the tail musculature in *Frit. borealis* f. *sargassi*, *Frit. formica* and also in *Frit. haplostoma*, although the range is not so wide in the latter two species as in the first species. Besides, it is a noticeable fact that the typical *Oik. cornutogastra* has scarcely mature gonad filling up the posterior portion of the trunk. Practically all specimens have only a small amount of ovarial and testicular tissues. Some individuals having a *cornutogastra*-type left stomach lobe were found to be fully mature. In these cases, however, I could not find any dorsal notch between the oikoplast epithelium and the genital region. The gonad in these individuals is quite the same in appearance as that in *Oik. fusiformis*; it covers the lateral sides of the alimentary organ. These facts seem to indicate that the dorsal notch is formed in old individuals by the ejection of genital products. If so, the only feature which characterizes *Oik. cornutogastra* is the shape of the left stomach-lobe, and this feature, as mentioned above, is far from being distinctive.

In spite of these facts, there are some individuals provided with the left stomach lobe like *cornutogastra* which represents the terminal member of a series of variation against typical *Oik. fusiformis*. So I prefer, at present, to treat *Oik. cornutogastra* AIDA as a forma of *Oik. fusiformis* FOL.

(2) *Oikopleura gracilis* LOHMANN 1896

(Fig. 3)

This species occurred in July and September at the frequency of 27% and in a small number, 22 in total. Trunk 400–460μ long, tail 1590–2000μ long in mature specimens. Tail musculature 150–180μ wide, chorda 22–27% of musculature in breadth at the middle. Endostyle relatively broad, and situated much nearer the anus than the mouth. Left stomach lobe roughly rectangular, with comparatively straight dorsal edge.

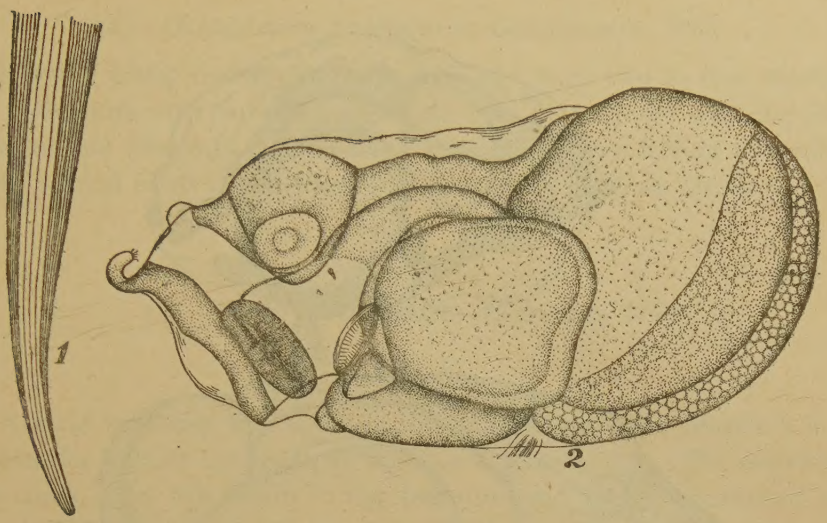

Fig. 3. *Oik. gracilis.* 1—Tip of tail musculature; 2—Left side of trunk. ×200.

(3) *Oikopleura parva* LOHMANN 1896

(Fig. 4)

Oikopleura najadis UEBEL ?

The present species under a casual examination simulates a small individual of *Oik. rufescens* FOL, as the stomach lobe is roundish and there are a pair of buccal gland cells. However, the species may be distinguished easily from the latter species by the following characteristics. 1) Trunk rather elongate in *Oik. parva*, while it is somewhat roundish in *Oik. rufescens*. 2) Oikoplast epithelium reaches scarcely the posterior end of the oesophagus in *Oik. parva*, whereas it reaches far beyond the posterior end of the stomach in *Oik. rufescens*. 3) While the gonad is situated on the dorso-posterior side of the alimentary organ in *Oik. parva*, it is found in *Oik. rufescens* on the posterior side of the stomach. 4) The buccal gland is larger in *Oik. rufescens* than in *Oik. parva*. 5) *Oik. parva* has a longer tail and narrower musculature. (See the table of the next page.)

The only difference between *Oik. parva* and *Oik. najadis* seems to be in the appearance of the tail musculature which is much wider in the latter than in the former, reaching 4-5 times the width of chorda. It is not impossible, however, that this characteristic is merely due to the difference in preservation.

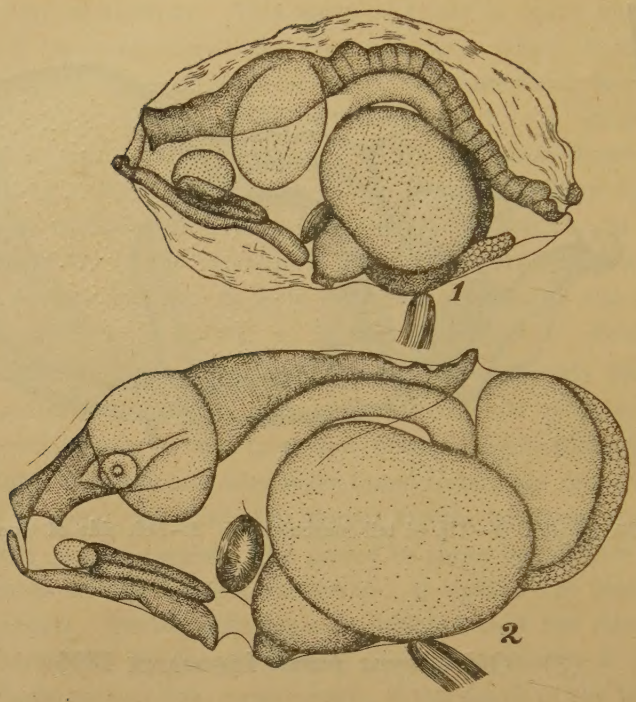

Fig. 4. 1—*Oik. rufescens*; 2—*Oik. parva*. ×110.

	Oik. rufescens	*Oik. parva*				
Trunk length (B) μ	590	630	660	710	780	800
Tail length (T) μ	2670	4290	4790	4430	4430	4930
Width of Tail Musculature (M) μ	220-260	190	250	220	260	270
$\frac{C}{M} \times 100$ (C-Width of Chorda)	32-33		61	52		51
$\frac{M}{T} \times 100$	9.0	4.4	5.2	5.0	5.6	5.5
$\frac{T}{B}$	4.5	6.8	7.3	6.2	5.7	6.2

(4) *Oikopleura cophocerca* GEGENBAUR 1885

In small young individuals there are only from two to four subchordal cells. Individuals with four subchordal cells may be confused with the preceding species and also with *Oik. najadis* UEBEL, while those having five subchordal cells remind us of *Oik. mediterranea* LOHMANN 1899 from Messina.

(5) *Fritillaria magna* LOHMANN 1896

(Fig. 5)

A giant specimen was found in the sample hauled at Station 2 in July. The posterior half of the trunk is mutilated considerably. The anterior half of the trunk, from the mouth to the posterior end of the alimentary organ, measures 1570μ in length. The tail is 5740μ in length, the breadth of the musculature reaches 270μ and the chorda is about 14% of the musculature in width.

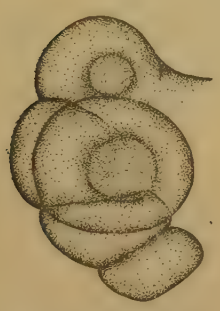

Fig. 5. *Frit. magna.* Group of glandular appendages on intestine. ×200.

Hood conspicuous, endostyle curled dorsally. There is a trace of glandular sac at each lateral side of the trunk on the level of the branchial aperture. A group of glandular appendages are found on the intestine (or on the pyloric portion of the stomach?). Tail fin terminates in a single pointed end as in *Frit. haplostoma*, but the chorda does not reach beyond the posterior end of the muscle. There are several cells scattered near the posterior end of the tail musculature as in *Pelagopleura verticalis*, although it is not certain whether the existence of such cells is a regular characteristic of this species or not. About a dozen of round nuclei are arranged in a row along the chorda.

(6) *Fritillaria charybdae* LOHMANN 1899

(Figs. 6 and 7)

Fifteen specimens were hauled from nine stations in July and September. At a glance, this species closely resembles *Frit. fraudax* LOHMANN. The most perfectly preserved individual is 1320μ in length and 590μ in width of the trunk, and 3300μ in tail length. Trunk somewhat rectangular in shape and

compressed dorso-ventrally. General structure of the trunk is nearly the same as that in *Frit. fraudax*, except the difference in the appearance of the alimentary organ and that of the gonad. Branchial aperture elongate, much longer than wide. There are several glandular appendages on the intestine, distal ends of which are usually divided into a few prominences. Stomach has a

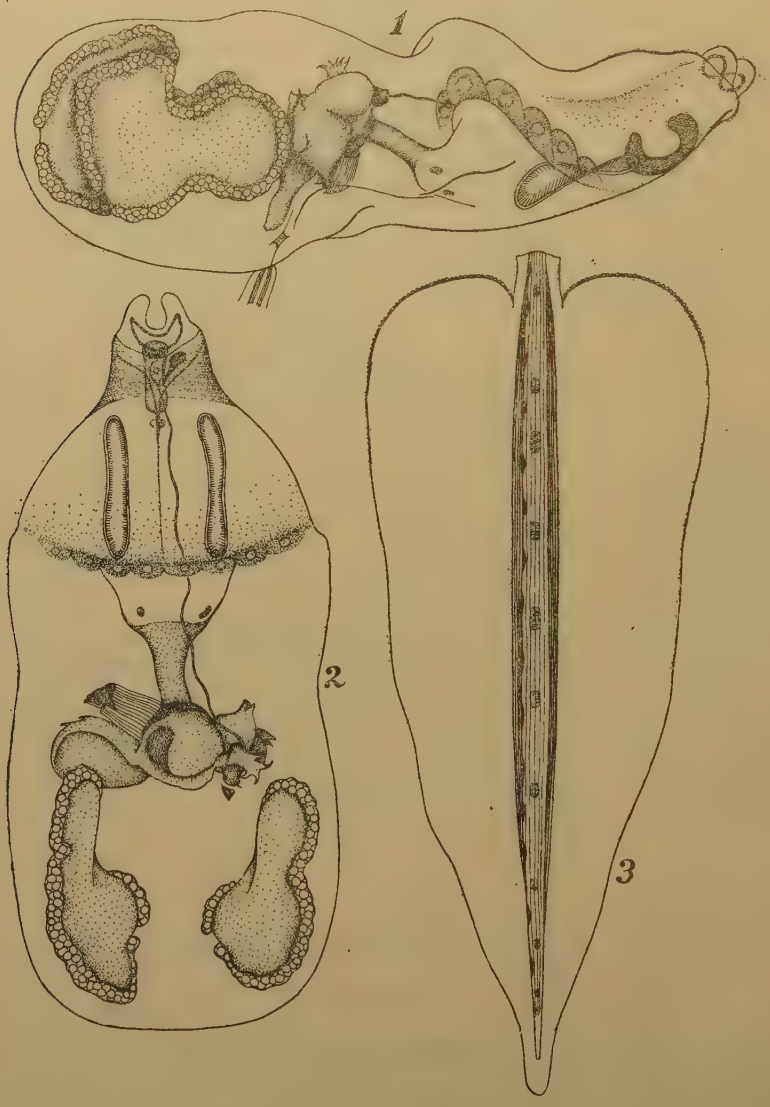

Fig. 6. *Frit. charybdae*. 1—Right side of trunk, ×75; 2—Dorsal side of trunk, ×75; 3.—Tail, ×35.

huge glandular appendage on the left side. This appendage is flat and roughly oval in shape, attached tightly to stomach by its two arms, of which the terminal parts are spread out and cover the stomach. Two flat gonads are situated vertically, and arranged parallel to each other. Each gonad consists of a large testicular mass and a string-like ovary, fringing the testis along its whole margin except a small space at the posterior portion. The middle part of each gonad is slightly narrowed.

Tail musculature very thin, slightly wider than chorda which reaches beyond the posterior end of the musculature. Tail fin is very wide and ends in a bluntly pointed end. About ten nuclei are distinctly found, arranged in a row along the chorda.

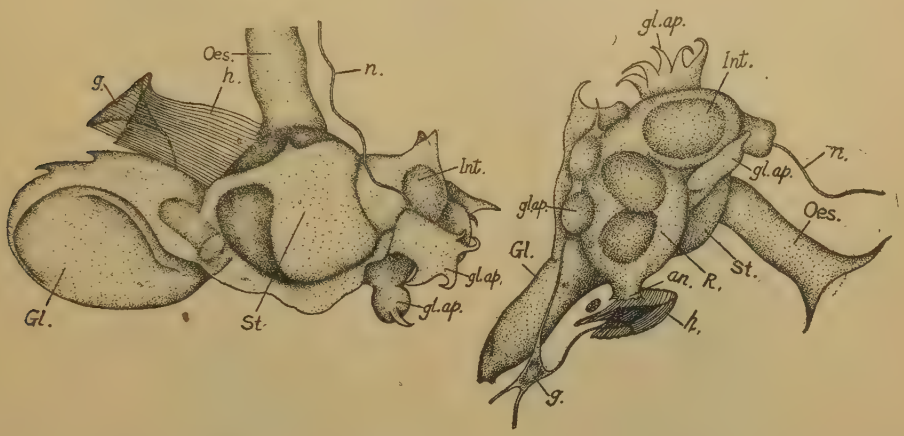

Fig. 7. *Frit. charybdae*. Alimentary organ; Left—dorsal, Right—right side, ×150. *an.*—anus, *g.*—ganglion, *Gl.*—huge glandular appendage of stomach, *gl. ap.*—glandular appendage of intestine, *h.*—heart, *Int.*—intestine, *n.*—nerve, *Oes.*—Oesophagus, *R.*—rectum, *St.*—stomach.

Remarks: The presence of a huge glandular appendage on the left side of the stomach and the existence of a pair of gonads are the characteristics differentiating the present species from most fritillarians known to date. *Frit. fraudax*, *Frit. antarctica* Lohmann, *Frit. helenae* Bückmann and *Frit. drygalski* Lohmann resemble the present species and evidently form together with the present species a special group in the genus, although they all differ distinctly from this species in the number of gonads. *Frit. urticans* Fol has paired gonads, but their shape differs considerably from that of the present species. In *Frit. urticans*, the ovary is situated in front of the testis.

(7) *Fritillaria tenella* LOHMANN 1896

(Figs. 8 and 9)

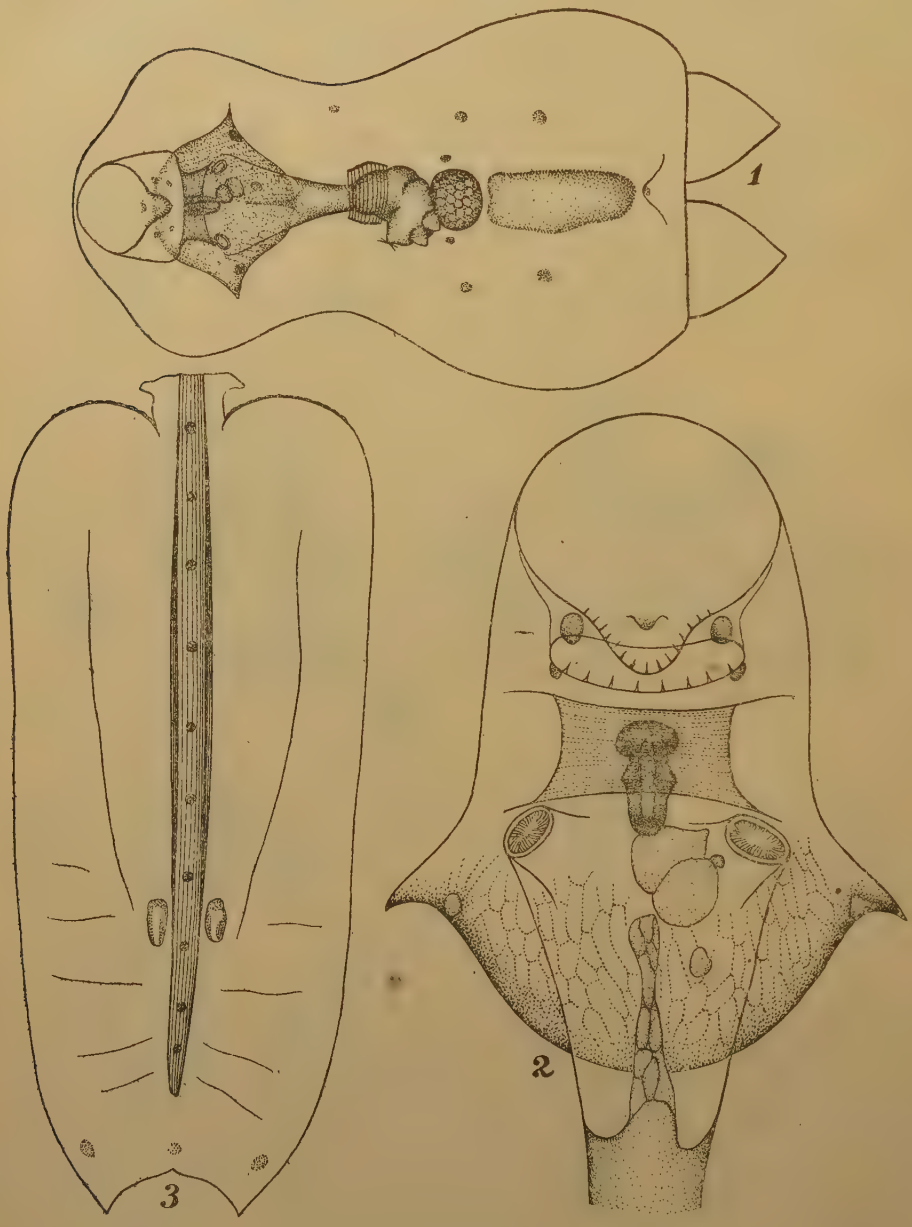

Fig. 8. *Frit. tenella.* 1—Dorsal side of trunk, ×35; 2—Anterior part of trunk, ventral, ×110; 3—Tail, ×35.

This relatively rare species occurs in abundance in the present material. I wish to give here exact descriptions of perfectly preserved specimens. mature specimens measure ca. 760μ in length and 450μ in width of the trunk. Trunk compressed dorso-ventrally; the anterior portion of the trunk forms a remarkable hood, the posterior end of the trunk is truncate and provided with a pair of large triangular protuberances. The middle portion of the trunk is somewhat narrowed. There are many gland cells scattered over the trunk:

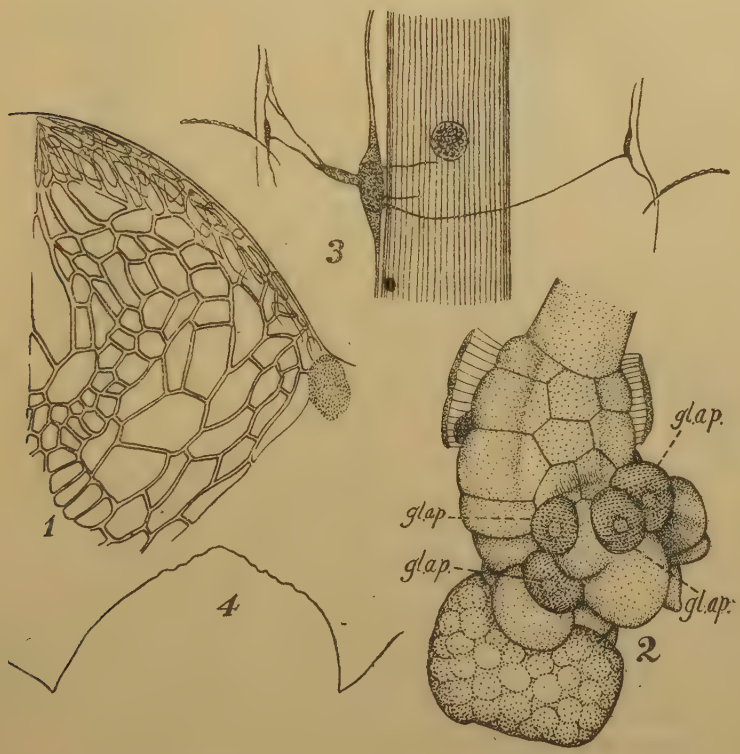

Fig. 9. *Frit. tenella.* 1—Oikoplast epithelium, left half, ×200; 2—Alimentary organ, dorsal, ×110; 3—Basal ganglion of tail, ×200; 4—Posterior incision of tail fin, ×110. *gl. ap.*—glandular appendage.

paired cells—two pairs near the mouth, one cell on each postero-lateral side of oikoplast epithelium, a dorsal pair and a ventral pair on the level of the middle of the testis; unpaired cells—a dorso-median one on the mouth, one on the left floor of pharynx behind the pharyngeal cells which are usually two in number, although they may be three in some individuals, a dorso-median cell above the oesophagus and also one near the posterior end of the trunk.

Several wall-cells of the intestine protrude out somewhat irregularly from the surface, of which at least four seem to be glandular appendages. Ovary spherical and situated in front of the median elongate testis. Tail 3340μ in length, fin very wide and cut widely at the posterior end. Margin of the incision smooth, or partly bluntly serrated in some specimens. Tail musculature narrow, scarcely wider than chorda, ten round nuclei arranged in a row along the chorda. A pair of comparatively large glands situated one on each lateral side of the musculature about a quarter of its length from the posterior end. Each gland consists of an anterior cell and two lateral cells. Three gland cells are observable along the posterior margin of the fin in perfectly preserved specimens.

(8) *Fritillaria venusta* Lohmann 1896

(Figs. 10 and 11)

Fritillaria venusta: Lohmann (1896) Plankton-Exped., pp. 46–47.
Fritillaria bicornis: Lohmann (1896) Plankton-Exped., pp. 47–48.
Fritillaria inverta: Essenberg (1926).
? *Fritillaria venusta*: Essenberg (1926).
Fritillaria venusta: Tokioka (1940).
Fritillaria bicornis: Thompson (1948).

It is a curious fact that there is neither description nor figure of the mature gonad of *Frit. venusta*. When we compare *Frit. venusta* with *Frit bicornis*, we find apart from the difference in structure of the gonad practically no difference. According to the descriptions and figures given by Lohmann, the tail of *Frit. venusta* has a pair of small protuberances at the middle of the posterior incision, while *Frit. bicornis* lacks this structure; *Frit. venusta* has a pair of round prominences on each side of the pointed posterior end of the trunk, whereas the posterior end of the trunk is truncate and without any prominence in *Frit. bicornis*. These structures are, however, somewhat different in Thompson's material. *Frit. bicornis* collected from the South Eastern Australian Region and examined by Thompson has the median processes in the posterior incision of the tail fin and a large posterior triangular prominence on the truncate posterior margin of the trunk. My material includes many perfectly preserved individuals which have a tail typical of *venusta* and a trunk of *bicornis*-type, although the trunk is provided with a pair of large posterior prominences just like in the case in *Frit. venusta*. These facts may justify the idea that *Frit. venusta* is identical with *Frit. bicornis*. *Frit. venusta* described by Lohmann seems to be individuals with immature gonad, while *Frit bicornis*

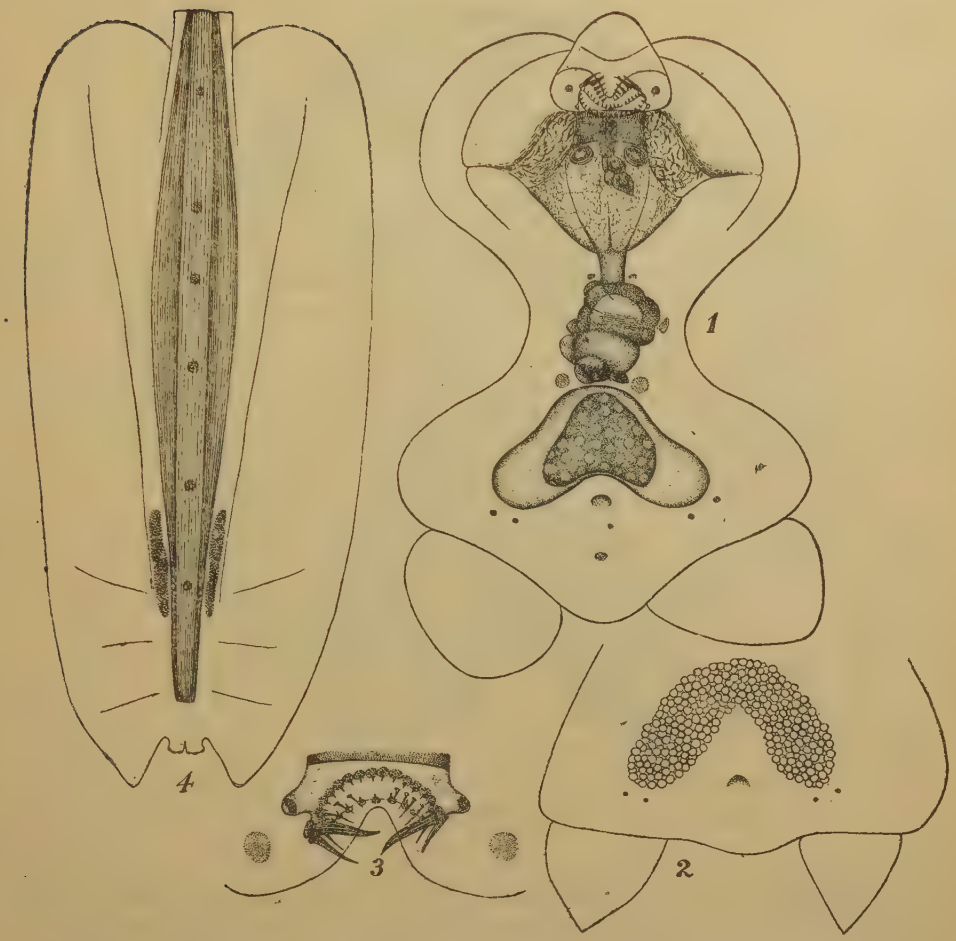

Fig. 10. *Frit. venusta.* 1 — Dorsal side of trunk, ×45; 2 — Posterior part of trunk, with truncate margin, ×45; 3—Mouth, ×150; 4—Tail, ×35.

described by him seems to be individuals with mature gonad but missing in the posterior prominences of the trunk and having imperfectly preserved tail. I prefer to call these two forms by the name of *Frit. venusta* on account of page priority.

Pharyngeal cells are usually four. Alimentary system has no glandular appendages. The posterior part of the trunk varies considerably in shape from triangular to nearly truncate. Two pairs of gland cells in the mouth part, one below the oesophagus and one behind the alimentary organ, a pair at each postero-lateral corner of the gonad and two median cells behind the gonad. Tail musculature three times as wide as chorda at the middle and with round nuclei arranged in a row. Chorda does not reach the posterior

Fig. 11. *Frit. venusta.* Oikoplast epithelium, ×200.

end of the musculature. In finely preserved specimens an inconspicuous gland is observable on each side of the tail musculature near the posterior end.

B. CHAETOGNATHS

The following 14 species are found in the material:

1. *Sagitta enflata* GRASSI
2. „ *elegans* VERRILL
3. „ *bipunctata* QUOY et GAIMARD
4. „ *ferox* DONCASTER
5. „ *bedoti* BÉRANECK
6. „ *serratodentata* KROHN
7. „ *regularis* AIDA
8. „ *neglecta* AIDA
9. „ *crassa* TOKIOKA
10. „ „ f. *naikaiensis* TOKIOKA

11. *Sagitta delicata* TOKIOKA
12. „ *minima* GRASSI
13. *Pterosagitta draco* (KROHN)
14. *Krohnitta pacifica* (AIDA)

Sagitta enflata, Sag. bedoti, Sag. regularis and *Sag. minima* are common species. *Sag. crassa* f. *naikaiensis* is rather common in Maizuru Bay. *Sag. delicata* was observed in abundance in July once in that bay at St. 41. *Sag. serratodentata* is represented by f. *atlantica.*

Table 2. Population of chaetognaths. In six columns of the haul, the left sign indicates the frequency and the right one shows the quantity.
Frequency ● ··· 70 % +, ○ ··· 30 – 70 %, + ··· 30 % –.
Quantity ● ··· 30 individuals / a haul +,
○ ··· 10 – 30 individuals / a haul,
+ ··· 10 individuals / a haul –. (in offshore waters)

	April		July		September		Summary	
	Vertical haul	Superf. haul	Vertical haul	Superf. haul	Vertical haul	Superf. haul	Frequency	Quantity
Sagitta enflata	++		●○	++	●○	○+	●○+ ●+	○++ ○+
„ *elegans*	++		++				+ +	+ +
„ *bipunctata*	○+						○	+
„ *ferox*			++		++		+ +	+ +
„ *bedoti*	●+		●○	++	●+	++	●●+ ●+	○++ ++
„ *serratodentata*			○+				○	+
„ *regularis*			●●	++	●●	●+	●● ●+	●+ ●+
„ *neglecta*			++	++	++		++ +	++ +
„ *crassa*			++				+	+
„ *crassa* f. *naikaiensis*	++	++		++			++ +	++ +
„ *delicata*								
„ *minima*	○+		●●		●○	○+	●○ ●○	●+ ○+
Pterosagitta draco			++				+	+
Krohnitta pacifica			○+		○+	++	○+ ○	++ +

I wish to refer here to specimens of *Spadella cephaloptera* BUSCH which were collected by Mr. I. YAMAZI in Nanao Bay on the coast of the Sea of Japan (Fig. 12). The formulae of these specimens are as follows:

Body length in mm.	Tail length in %	Hooks	Anterior teeth	Posterior teeth
2.5	52.3	8–9	3–3	1–1
2.7	55.4	8–8	2–2	0–0
3.0	51.2	8–8	3–3	1–1
3.0	48.6	8–8	3–3	1–1
3.0	48.6	8–8	3–3	1–1

There is no peculiarity in this table. There are, however, two points to be mentioned specially of these specimens: one is on the range of the lateral fin and the other on the shape of the seminal vesicle. The lateral fin begins at the tail septum in all Japanese specimens observed so far, while in the specimens from Nanao Bay the lateral fin begins at the anterior end of the seminal receptacle considerably in front of the septum. The seminal vesicle is roughly elliptical in outline in specimens hitherto collected from the Japanese waters, while the Nanao Bay specimens have the vesicle provided with a sharply pointed prominence protruded obliquely forward from the postero-lateral corner. These unmistakable characteristics seem to be sufficient to distinguish the present material as a special form of *Sp. cephaloptera*, although they scarcely deserve specific distinctions. I wish to name the present form f. *angulata* because of its angulated seminal vesicle.

II. FAUNISTIC

A. PELAGIC TUNICATES.

Most of the species described here are of warm oceanic species. *Oik. dioica* is abundant in inlet or stagnant waters. This was common in Maizuru Bay. The frequent occurrence of this species in the off-shore waters seems to be a characteristic of the appendicularian fauna in Japan Sea, differing from that on the Pacific Coast of Japan. The occurrence of *Oik. labradoriensis*, a cold water form, is a very interesting phenomenon, and will be referred to in the following chapter. Warm oceanic water appendicularians were much more abundant in July and September than in April, both in number of species and in individual numbers. Generally speaking, they are commoner in offshore waters than in costal or bay waters, although dense swarms of the species, such as *Frit. haplostoma*, may be found in coastal waters, and large but monotonic swarm of *Oik. dioica* occurs in the inlet waters. Appendicularians seem

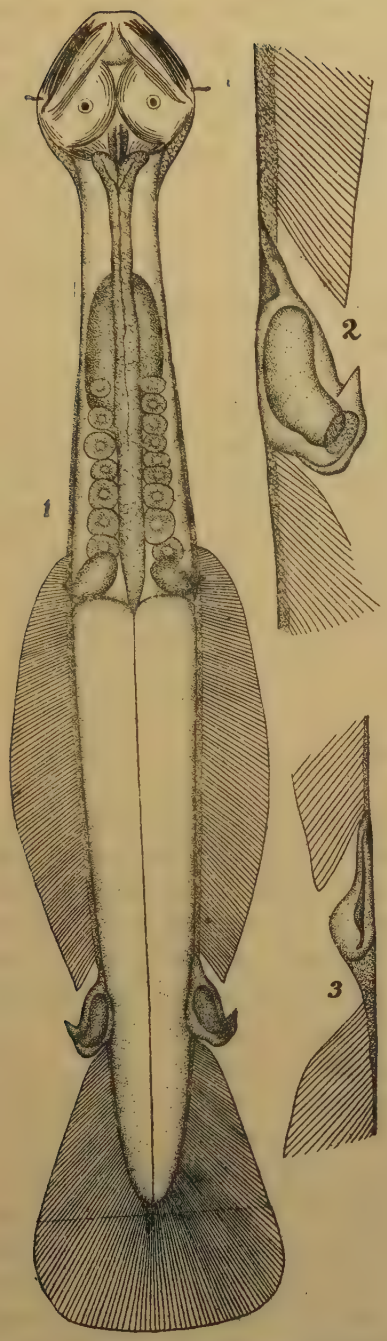

Fig. 12. *Spadella cephaloptera* f. *angulata* n. f. 1—Entire animal, dorsal, × 55; 2—Mature seminal vesicle, dorsal, × 150; 3—Immature seminal vesicle, dorsal, × 150.

to be scarce both in the superficial layer and in the depths. Twenty species were found in 38 vertical hauls, and 14 species in 80 superficial hauls and only 4 in two hauls below 150 m. Of course, the individual number decreases in parallel with the number of species, although there are considerable difference in the proportion of each species, between the superficial hauls and the vertical ones.

B. CHAETOGNATHS.

The same tendencies as shown in pelagic tunicates can be noticed also in chaetognaths. Most of the chaetognaths were of warm oceanic species. *Sag. elegans*, a cold water species, was found sparsely in the deep layer near the bank. In Maizuru Bay, *Sag. crassa* f. *naikaiensis* and *Sag. delicata* occur sometimes in a large number. *Sag. delicata* is the only chaetognath in the inner parts of several bays along the coast of Kii Peninsula, where *Sag. crassa* f. *naikaiensis* is entirely missing. It is a noteworthy fact that *Sag. delicata* and *Sag. crassa* f. *naikaiensis* occur in the same bay. This fact suggests that *Sag. delicata* does not represent a distinct species, but it is merely a form of *Sag. crassa*, standing in the same relation as f. *naikaiensis* with typical *Sag. crassa* which was recorded twice in the present material, in July at St. 2 and 3 near the bank. *Sag. delicata* is known also in Nanao Bay on the coast of Japan Sea. Chaetognaths were most abundant in July both in number of species and in individual numbers and least in

April. They are most numerous in the bay, because *Sag. crassa* f. *naikaiensis* and *Sag. delicata* are found there. They are scarce in the superficial layer and far less in the deeper layer below 150 m. Only 7 species occurred in the superficial hauls and 4 species in two hauls below 150 m. Of course, there are considerable differences, in the proportion of each species, between the vertical hauls and the superficial hauls.

III. SOME NOTES ON THE HYDROGRAPHICAL CONDITION AROUND THE BANK

There are two noteworthy findings among the present data. One is the occurrence of the cold water forms, *Oik. labradoriensis* and *Sag. elegans*, in the deeper water above the bank in April and July. Except one case in April, when *Sag. elegans* occurred in 50–0 m haul at St. 30, they were found below 150 m.

	April	July	September
Oik. labradoriensis	+	−	−
Sag. elegans	+	+	−

This fact seems to show the existence of the submerged cold current, probably the Liman Current, below the warm Tusima Current on the New Yamato Bank. The strength of this submerged cold current seems to be most vigorous in April reaching 50 m to the surface; it decreases somewhat in July and becomes very weak in September when the warm current is very strong and flows far into Maizuru Bay. The increase of the number of species in the bay in September indicates the strong influx of the oceanic water.

Another noticeable fact is the occurrence of *Sag. crassa* f. *typica* and f. *naikaiensis* and also of a considerable number of *Oik. dioica* in the offshore waters around the bank. These chaetognaths and appendicularian are known to live in Kiauchau Bay on the southern coast of Shantung Peninsula of North China, Yellow Sea, Southern and Eastern Coastal Waters of Tyôsen (=Korea). It is difficult to consider them to be originated from the coastal waters along the northern coast of Honsyû, for instances from Wakasa Bay or Maizuru Bay. It seems to be more probable that they are the drift forms carried from the coastal waters around Tyôsen. Thorough surveys extending from the New Yamato Bank to Tyôsen will be necessary to make out this point.

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NOTICES ON TABLES 3—6

In the column of species, the forms indicated with * are chiefly juvenile ones, the form with ** represents the smaller form and that with *** show the larger form.

Table 3. (Surface hauls)

April 26–28	Bay		Coastal Waters									Oceanic Waters												on Bank		Number of Stations / Number/st.	
10 minutes haul (*5 min.)	1*	3*	8	9	11	13	14	15	16	16B	17	18	19	21	22	23	24	26	27	28	29	31	36	37	38		
Tadpole larva of Ascidians																											
Doliolum nationalis																											
Oikopleura longicauda			2			4	4	77	1	27	5	13	68	16	1	36	22	66	17	3	16	1	4	4	5	21	19
〃 *fusiformis*																											
〃 〃 f. *cornutogastra*																											
〃 *dioica*	12	3	9	6	1	4	2	1	2			1				2	1	5			2	1			1	16	3
〃 *rufescens*																											
〃 *cophocerca*																											
〃 sp.*													1													1	1
Megalocercus huxleyi																											
Stegosoma magnum																											
Pelagopleura sp.																											
Fritillaria haplostoma																											
〃 *formica*																											
〃 *pellucida*																											
〃 *borealis*																											
〃 〃 f. *sargassi-intermedia*																											
Appendicularia sicula																											
Sagitta enflata																											
〃 *bedoti*																											
〃 *regularis*																											
〃 *neglecta*																											
〃 *crassa* f. *naikaiensis*														1												1	1
〃 *minima*																											
〃 sp.*													2		2											2	2
Krohnitta pacifica																											
Number of Pelagic Tunicates	12	3	11	6	1	8	6	78	3	27	5	14	69	16	1	38	23	71	17	3	18	2	4	4	6	5	
Number of Chaetognaths													2	1	2												
Number of species	1	1	2	1	1	2	2	2	2	1	1	2	3	2	2	2	2	2	1	1	2	2	1	1	2	Total	
(Mean)	1	(1)					2		(2)								5		(2)					2	(2)		

Table 4. (Surface hauls)

July 25 10 minutes haul (*3~5 min.)	Maizuru Bay						Coastal Wat.				Oceanic Waters										Stations on Bank						Number of Stations	Number/st.
	41*	42*	43*	44*	45*	46*	47*	48	49	50	53	54	19*	20	21	22	23	24	25		26	27	55	58*	57*	56*		
Todpole larva of Ascidians	1																										1	1
Doliolum nationalis																2	3	19					1			1	5	5
Oikopleura longicauda		2			6	1	4					4		3	4	2		2	2		5	3	2				13	3
〃 *fusiformis*		1		2	1	1	3		3	2	3	1	4	7	7	16	26	16	4		13	7	10	1	2	16	22	7
〃 〃 f. *cornutogastra*																												
〃 *dioica*	41	1	12	7	1		4			1	3	5	8	1	3	2		2					10		1	1	17	6
〃 *rufescens*																												
〃 *cophocerca*								1			2	4	3	4	1	3		1	1				1				12	2
〃 sp.*	1	1																										
Megalocercus huxleyi																												
Stegosoma magnum																												
Pelagopleura sp.																												
Fritillaria haplostoma																												
〃 *formica*																												
〃 *pellucida*																												
〃 *borealis*																							3				1	3
〃 〃 f. *sargassi-intermedia*											1	2	1					1									4	1
Appendicularia sicula												1			1								1				3	1
Sagitta enflata														1				1	1		1						4	1
〃 *bedoti*													1														1	1
〃 *regularis*																						1					1	1
〃 *neglecta*																							1				9	4
〃 *crassa* f. *naikaiensis*	10	6	8	1						1	1	5	5															
〃 *minima*														4					2								2	3
〃 sp.*																												
Krohnitta pacifica																												
Number of Pelagic Tunicates	43	5	12	9	8	2	11	1	3	3	9	16	16	15	15	25	29	41	7		18	10	27	1	3	18	Total 41	
Number of Chaetognaths	10	6	8	1						1	1	6	6	5	1		1		3		1	1	2					
Number of species	4	5	2	3	3	2	3	1	1	3	5	7	6	6	5	5	3	6	5		3	3	8	1	2	3		
(Mean)			6 (3)					5 (2)						11 (4)									10 (3)					

Table 5. (Surface hauls)

September 25–27 10 minutes haul (* 5 m.n.)	Maizuru Bay						Coastal Waters									Oceanic Waters							Stations on Bank							Number of Stations	Number/st.
	32*	30*	1*	29*	2	28*	27*	3	4	5	26	7	8	25	9	10	24	23	22	21	11	12	20	13	14	15	16	17	18	19		
Tadpole larva of Ascidians																																
Doliolum nationalis																																
Oikopleura longicauda			2	5	5	2	3	7	11	8	1	11	10	2	3		1	7	5	1	11	8	10	15	9	9	27	9	33	4	27	8
〃 *fusiformis*	2		2				1	3	5		1	3	21	3				6	5	1	2	4		5		2	6		3	5	19	4
〃 〃 f. *cornutogastra*																										2	1	2			3	2
〃 *dikica*	1	1																													2	1
〃 *rufescens*	1									1		2	2	1	3	2	2	2	3	5		7		3	1	3	1	3	2	4	19	3
〃 *cophocerca*																						1									1	1
〃 sp.*						1					2	3		1	1	2	1	2	1	1		2	1	4	1		2	1		3	17	2
Megalocercus huxleyi																1	1											1			3	1
Stsgosoma magnum												1						1												1	3	1
Pelagopleura sp.																								1							1	1
Fritillaria haplostoma		38	9	81	2	7	26				3																				7	24
〃 *formica*																						3		1						1	3	2
〃 *pellucida*																								1		2					2	2
〃 *borealis*																																
〃 〃 f. *sargassi-intermedia*																																
Appendicularia sicula																																
Sagitta enflata				3							2				2			1	3	3		5	1	10			1			1	11	3
〃 *bedoti*												2																			1	2
〃 *regularis*	2			2				1		1				1	4	4		2	3	2	1	5	11	13	1	7	5	11	5	3	20	4
〃 *neglecta*																																
〃 *crassa* f. *naikaiensis*			1																												1	1
〃 *minima*													1	1	6				2	3		5		5			1	1		1	10	3
〃 sp.*						1						6			3	1	3	3	1	5	1	5		6	2	1		1	1	3	16	3
Krohnitta pacifica								1							1									2				1			4	1
Number of pelagic Tunicates	4	39	13	86	7	10	30	10	16	9	7	20	33	7	7	5	5	18	14	8	13	25	11	30	11	18	37	16	38	18	Total 20	
Number of Chaetognaths	2		1	5		1		2		1	2	8	1	2	16	5	3	6	9	13	2	20	12	36	3	8	7	14	6	8		
Number of species	4	2	4	4	2	4	3	4	2	3	5	7	4	6	8	5	5	8	8	8	4	10	4	12	5	7	8	9	5	10		
(Mean)			10 (3)							13 (5)									12 (7)							15 (8)						

Table 6. (Vertical hauls)

( ) indicates the depth in m.	April 26–28										July 25																								September 25–27										Number of Stations	Number/st.
	2	6 (50)	8	20 (50)	25 (150)	30 (50)	30 (150)	35 (50)	35 (150)	38 (150)	41	11 (75)	10 (150)	9 (150)	8 (150)	7 (150)	6 (150)	5 (150)	200 | 400	4 (150)	4 (350)	3 (150)	3 (350)	2 (150)	2 (350)	150 | 300	1 (150)	1 (350)	32 (10)	33 (50)	16 (150)	16 (350)	15 (150)	15 (350)	17 (150)	17 (350)	19 (150)	19 (350)		
Thalia democratica																								1																	1	1
Doliolum nationalis														2		2	6			3	7	2	1	7	1		1			1									1	12	3
Oikopleura longicauda		9	2	10	12	12	12	246	87	317		10	88	79	178	27	97	351		504	359	218	180	409	213	1	372	99	89	404	78	150	230	203	55	25	68	142	33	159
" *fusiformis*												1	18	14	3	1	14	16		17	6	29	12	26	44		46	21	2	104	12	31	26	35	4	6	3	8	24	21
" " f. *cornutogastra*																					3	3	7	8					4		2			1				7	4
" *gracilis*																						1		1			8	2		1	4		3		1	1			9	2
" *dioica*	7	3	1					9	2	6	26							1		3				4	1				110	2								10	3
" *rufescens*													1	1	1		1			13	2	34	31	49	49	1	15	7		44	15	33	17	21	11	4	1	1	21	17
" *parva*																				1	8		4	2	8			5		1			1		1			9	3
" *cophocerca*																		1		4	2	5		3	4		3			3		3	4	6			1	1	13	3
" *labradoriensis*							1		1	1																													3	1
" sp.*													1					3	1	2	9	6		24	14			5		12	6	7	16	14	2	5	1	7	17	8
Megalocercus huxleyi																							4	6	4														3	5
Stegosoma magnum																														4									1	4
Fritillaria haplostoma													1		1		2	1		7	9	4	4	5	2		22		331	619	10	4	38	22	2	1	1	4	20	38
" *magna*																								1															1	1
" *formica*														3		3	7	2		8	7	5	6	10	9		16	1		2	4	7	7	11		1	1	1	20	6
" *charybdae*																				1	2		1		1			1				1		2		2		4	9	2
" *pellucida*													37	105	1		13	7		8	26	18	12	33	30		41	11		10	14	6		20	4	6	3	6	21	20
" *borealis*												1		2			9	9		3	2	3	1	2	7		15			4	2	2	11	15				1	17	5
f. *sargassi-intermedia* **																																								
" " f. *sargassi* ***																						2	1												1				3	1
" *tenella*															1					42	94	36	43	142	111		133	57			8	15	7	12	5		4	2	16	45
" *venusta*																					4	2	1	14	14		3	5			9	10	6	5		1		2	13	6
" sp. *																			1	3	8	1		4	3			3		1		2	2	4				5	11	3
Appendicularia sicula														1																1									2	1
Sagitta enflata								1	1			7	6	5	4		4	3		35	63	43	42	47	42		29	13	3	113	4	12	6	3	3	4	1	4	25	20
" *elegans*						2	1												1			1				1		2											5	2
" *bipunctata*		1			1	1																																	3	1
" *ferox*																					2						1											6	3	3
" *bedoti*		1	1		1	3	4	9	1	2		1	10	16	10	4	49	15	1	43	50	25	23	33	21	5	19	10		7	1	2	6	1	1		3	1	33	12
" *serratodentata*													2	1			2	1		1		1		1			1												8	1
" *regularis*												2	3	1		1	1	1		101	115	168	150	71	76	1	103	37		75	19	20	52	57	23	11	15	30	23	49
" *neglecta*														1							3	2	2										1						5	2
" *crassa*																							1	1															2	1
" " f. *naikaiensis*	66		1																										95										1	1
" *delicata*											216																													
" *minima*					1	1	5	10	9	4		10	73	130	91	7	53	96	1	233	248	301	320	348	164		285	53		11	4	13	8	29	9	13	4	2	30	85
" sp. *		2		1	1	1		10		8		1	3	1	4		7	18		13	11	10	2	10	16		9	5		3	5	1	6		3			6	26	6
Pterosagitta draco																											2												1	2
Krohnitta pacifica																	1				3	2			1		4	1	1	14	2	2	3		1			2	12	3
Number of Species	2	5	4	2	5	6	5	6	6	6	2	9	12	15	9	8	14	15	5	21	24	25	22	27	23	5	20	20	7	22	17	21	19	18	15	14	14	21	↑ in offshore waters	

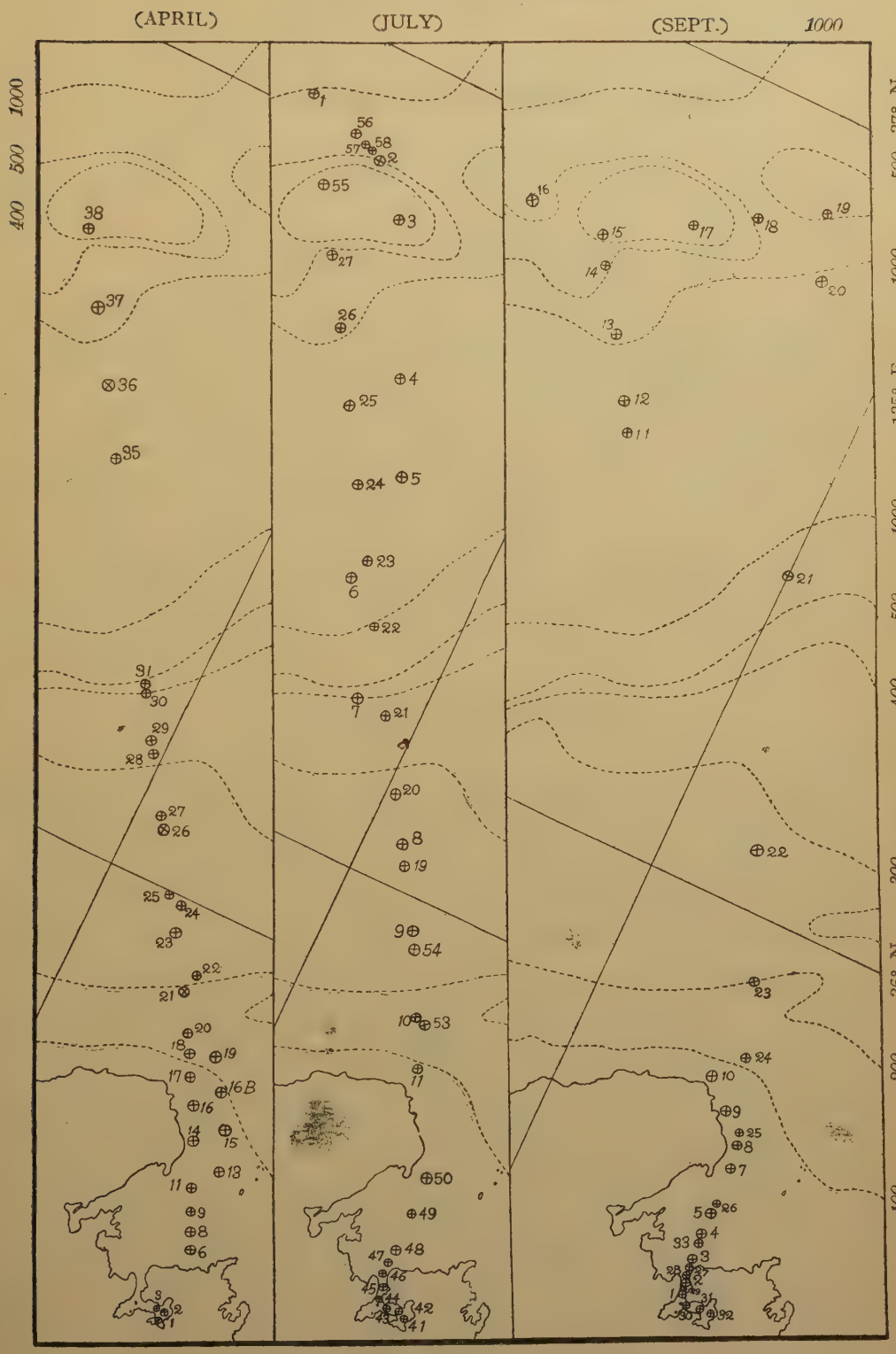

Chart 1. Map showing the stations.

EUNEPHTHYA FROM MIDDLE JAPAN*

Huzio UTINOMI

With Plate I and 5 Text-figures

In the course of my researches on the Nephthyid corals of Japan, four species belonging to *Eunephthya*, which is commonly known as a boreal genus, came to my hand. Among the materials, two species *E. spiculosa* Kükenthal and *E. hirotai* n. sp. were taken from the Sagami Bay and are now deposited in the museum of the Zoological Institute of the Tokyo University. The remaining two, *E. serratospiculata* n. sp. and *E. bicolor* n. sp. are from the Kii region, and are now preserved in our Laboratory.

Before going further, I express my cordial thanks to Prof. K. Takewaki of the Tokyo University for providing me with the material. A part of the expense in this study has been defrayed from the research fund supplied by the Ministry of Education.

Discussion on Nomenclature

Among all the families of octocorals, the Nephthyidae is probably the most difficult one as for systematic treatment. Among the commonly recognized genera, *Eunephthya*, *Gersemia* and *Capnella* are without "Stützbundel." These have been frequently confused with one another and also with other genera with "Stützbundel." For details of the very complicated history of the taxonomy of these genera, the reader is referred to Kükenthal (1903–1907), Molander (1915) and Broch (1923).

The genus *Eunephthya* was established by Verrill (1869) for two species *E. thyrsoidea* from South Africa and *E. glomerata* from Greenland. Kükenthal (1906) relegated the former species to *Capnella* and retained only the latter in the genus as the logotype. According to Broch (1939), *E. thyrsoidea* is in all probability identical with *Capnella rugosa* Kükenthal (=*C. gilchristi* Thomson). He further suggests that *E. glomerata* also is to be referred to the

* Contributions from the Seto Marine Biological Laboratory, No. 167.

genus *Capnella* (sensu KÜKENTHAL) on account of the enormous variation in both the shape and the numbers of spicules in canal-walls, which example was followed by MADSEN (1944, 1948).

If this suggestion be adopted, VERRILL's *Eunephthya* must be included in the genus *Capnella*, the former name being preoccupied by the latter. However, most of the species belonging to *Eunephthya*, as pointed out by KÜKENTHAL, are provided only sparsely with spicules in the canal-walls of the coenenchyma, or they are entirely devoid of spicules.

The genus *Capnella* was established by GRAY (1869) in the same year as VERRILL's *Eunephthya*, but slightly previous to this, for *Alcyonium imbricatum* Q. et G. It is hardly possible, however, to find out any definite differential characters between the genera from the original definitions of GRAY and VERRILL as far as can be judged. KÜKENTHAL (1903) extended the generic concept of *Capnella* to include *Paranephthya* WRIGHT and STUDER (1889); he also proposed *Paraspongodes* (1896), but later merged it into either *Capnella* or *Eunephthya*.

Gersemia, another kindred genus, was established by MARENZELLER (1878) to include *Gorgonia florida* RATHKE and *Gersemia loricata* MARENZELLER. KÜKENTHAL (1906), however, considers that the specimen referred by MARENZELLER to *florida* is not identical with RATHKE's original *florida*, and both are the members of *Eunephthya* (sensu KÜKENTHAL). BROCH (1939), more recently, gave reasons for referring RATHKE's *florida* to *Capnella*. Previous to this, MOLANDER (1915) retained this species in the genus *Eunephthya* and identified *Gersemia loricata* to *G. fruticosa* (=*Eunephthya fruticosa* of earlier authors).

MOLANDER (1915) rejected this generic differentiation between *Gersemia* MARENZELLER and *Eunephthya* VERRILL, based on the presence or absence of a so-called calyx, as proposed by KÜKENTHAL. But he retained both the names for other reasons; that is, *Eunephthya*, according to him, is represented by *Eunephthya nephthyiformes* (sensu KÜKENTHAL) and *Gersemia* is identical with *Eunephthya alcyoniformes* (sensu KÜKENTHAL). If both the genotypes of *Gersemia*, viz. *G. florida* and *G. loricata*, be truly identical with *Eunephthya* (*Gersemia* sensu MOLANDER) *fruticosa* (SARS), as MOLANDER points out, the name of *Gersemia* should be abandoned as a synonym according to the rules of zoological nomenclature.

The diagnostic key to the two genera, *Gersemia* and *Eunephthya*, given by MOLANDER (1915, p. 45), is as follows:

A) Anthocodiae retractile, points of branches with profuse development of coenenchyma, anthocodial spicules rods, spindles and rollers with girdles ... *Gersemia* MARENZELLER.

B) Anthocodiae not retractile, points of branches with insignificant coenenchyma, anthocodial spicules clubs, spindles and rods ... ... *Eunephthya* VERRILL.

As will be found in the following pages, all of the four species in the collection have more or less intergrading characters, which may be referable to either the genus *Gersemia* (sensu MOLANDER) or to the genus *Eunephthya* (sensu MOLANDER). They share the features that: (1) the rather poor development of the coenenchyma in the branches,* (2) the non-retractile anthocodia, (3) the absence of the so-called calyx, (4) the exclusively spindle- or rod-shaped spicules in the anthocodia and (5) the asymmetrical development of the anthocodial armature (except in *E. bicolor*).

Therefore I cannot accept the proposal to divide the genus *Eunephthya* (sensu KÜKENTHAL) into two groups or genera, *E. nephthyiformes* (=*Eunephthya* sensu MOLANDER) and *E. alcyoniformes* (=*Gersemia* sensu MOLANDER). But I do not venture to erect a new genus for these Japanese forms, including *Eunephthya japonica* KÜKENTHAL and *Gersemia marenzelleri* KÜKENTHAL which have never been rediscovered. MOLANDER (1915, p. 15) also finds a more significant morphological transition from *Gersemia* to *Eunephthya* in examples of *E. spiculosa* and *E. japonica*. These morphological features, as well as the geographical distribution, seem to show that the Japanese forms of *Eunephthya* represent transitional stages from the real boreal forms of *Eunephthya* (including *Gersemia*) to the warm-water forms of Nephthyids, such as *Capnella*, *Litophyton* (=*Lithophytum*), *Stereacanthia*, etc.

If BROCH's (1939) suggestion, cited above, as to the identity of the type species of *Eunephthya* VERRILL to the genus *Capnella* GRAY, be generally accepted, the genus *Eunephthya* which name I intend to use here should be applied to a number of species formerly referred to *Capnella*. Incidentally, a great number of species formerly referred to *Eunephthya* and *Gersemia* should be transferred to the genus *Gersemia* MARENZELLER, which is the oldest name subsequent to *Eunephthya* VERRILL. For the present, however, I am willing to retain *Eunephthya* as its generic name, since I have not had the opportunity of investigating *Eunephthya glomerata* and other northern forms to verify whether BROCH's conception is correct or not.

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* In *Eunephthya bicolor*, the terminal branches are rather highly developed, but not contracted in formalin. In *E. hirotai*, the branches are more ramified, and show the poorest development of the coenenchyma.

Description of Species

1. *Eunephthya spiculosa* KÜKENTHAL

(Fig. 1)

Material. Sagami Bay; depth and date unlabelled. A specimen, *Eunephthya spiculosa* det. K. KINOSHITA. Collected by K. AOKI.

An upright, bushy colony superficially resembles *Eunephthya japonica* KÜKENTHAL in its ramification and coloration, but the spiculation seems to agree with *E. spiculosa* KÜKENTHAL. The present specimen is also from the type locality of the latter.

Fig. 1. *Eunephthya spiculosa* KÜKENTHAL. *a*, Polyp, ×20; *b*, polyp spicule, on abaxial side, ×50; *c*, polyp spicule, on lateral side, ×67; *d*, *e*, tentacle base spicules, ×67; *f*, *g*, cortical spicules of stalk, ×67; *h*, *i*, spicules from canal-wall, ×67; *j*, tentacle spicules, ×67.

The colony has a total height of 4.5 cm of which 1 cm is the sterile stalk. The base spreads over sand and shell particles; it measures about 1.6 cm in thickness. From the upper two-thirds of the colony arise about twenty branches which give off many short polyp-bearing branchlets. The color of the colony is light brown.

The polyps are in clusters, rather large, club-shaped, with incurved head. They are about 2–4 mm in total height, and 1–1.3 mm in diameter of the head which is up to 1.5 mm in length. The anthocodial armature consists of closely packed larger spicules of the abaxial side and sparsely set smaller ones of the adaxial and lateral sides (Fig. 1*a*).

All these spicules are warty spindles, either straight or bent, and of various sizes. In the uppermost part of the polyp the spicules are more or less regularly disposed in 8 double rows, and pass on to the converging smaller (0.3–0.6 mm long) spindles which lie at the base of infolded tentacles over the mouth. These uppermost spicules on the lateral sides are 0.8–1.2 mm long and 0.08 mm wide (Fig. 1*c*). On the abaxial side they are more warty, larger, about 1.2–1.8 mm long and about 0.17–0.2 mm wide (Fig. 1*b*), and the distal pointed end of 2 or 3 larger ones projects beyond the surface of the polyp.

The tentacles are all infolded over the mouth, and provided with flat rodlets (Fig. 1*j*), about 0.1 mm long, transversely arranged on the aboral side, but not on the pinnules, which number 10 in a row on each side.

The cortical spicules of the branch and stalk are warty spindles as in the polyp, but with larger, often forked warts and with blunt or dentate ends (Fig. 1*f, g*). The canal-walls are thin and sparsely filled with warty spindles up to 0.9×0.1 mm in size (Fig. 1*h, i*). All these spicules are colorless. No other type of spicules is found.

Thomson and Dean (1931, p. 182) recorded this species from the Siboga collection, but referred it to the genus *Stereacanthia* on account of the canal-walls being thickly filled with spicules. Very likely the specimen represents a different species. Broch's (1935, p. 18) view regarding the identity with the Arctic and North Pacific form *E. rubiformis* (Ehrenberg) is also incredible.

2. *Eunephthya hirotai* n. sp.

(Fig. 2)

Material. 1.5 miles off Niisima, south of Sagami Bay; depth unlabelled. Two fragments without basal stalk. Collected by Sadamori Hirota. August 10, 1893.

Terminal branches in one of the specimens examined stand about 1.5 cm

in height and has a maximum spread of 2.6 cm. The polyps, clustered on the ends of slender branchlets or scattered singly on all sides of branches, are small, coral-red in color, club-shaped, with strongly bent head, up to 2.8 mm in height and 0.85 mm in diameter. The stalk of the polyp is longer than the head, though not distinctly demarcated, and about 0.5–0.85 mm in diameter (Fig. 2*a*).

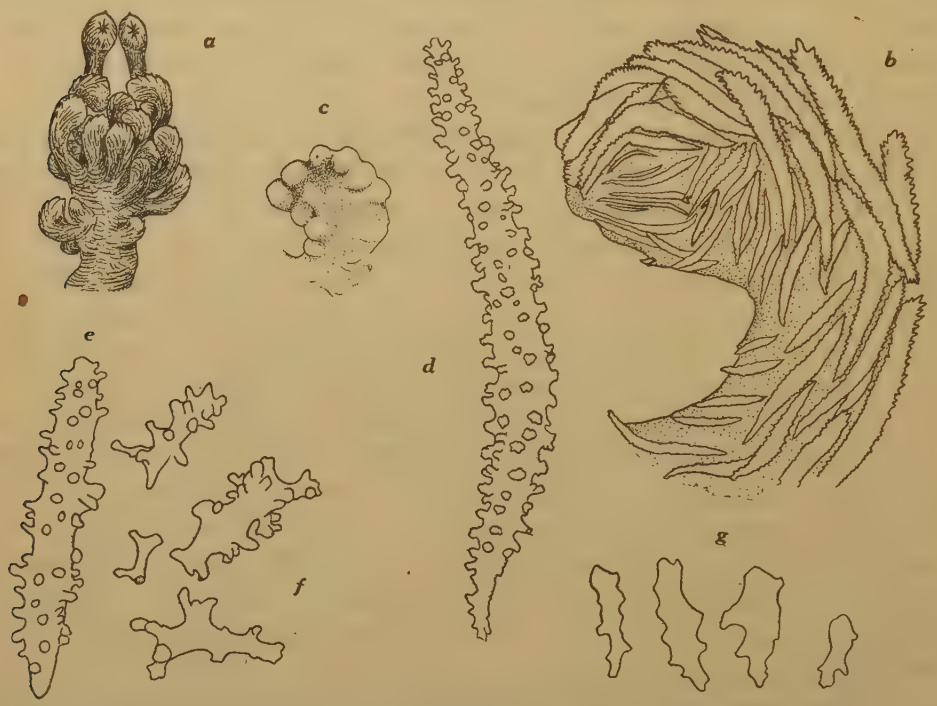

Fig. 2. *Eunephthya hirotai* n. sp. *a*, Terminal branchlet with polyps, ×7; *b*, polyp, ×17; *c*, tentacle, contracted, ×63; *d*, polyp spicule of coral-red color, ×80; *e*, *f*, colorless cortical spicules of branches, ×80; *g*, tentacle spicules, ×150.

The polyp armature is almost like that of the preceding species, but the arrangement of polypal spicules is somewhat more irregular (Fig. 2*b*). The abaxial side of the head is thickly covered with stouter thorny spindles (Fig. 2*d*), up to 1.1 mm long by 0.4 mm wide; the upper end of 2 to 4 longer ones is jagged, and a little projects above the surface, giving the polyp a very rough appearance. All of these spicules are coral-red in color.

The tentacles are completely infolded over the mouth, each bearing 5 pairs of short, contracted pinnules. Its aboral side is armed transversely with small, colorless, flat rodlets with irregular processes, up to 0.12 mm in length (Fig. 2*c*, *g*.)

The cortical spicules of the branch are closely arranged transversely. These are all colorless spindles, mostly 0.5–0.9 mm in length. Smaller thorny spindles or rods with blunt ends and irregular projections which are the derivatives of spindles, are also found (Fig. 2*e*, *f*). The canal-walls are apparently devoid of spicules.

This species is unique in its coloration and ramification of the colony, as well as in the shape of polyp armature.

3. *Eunephthya serratospiculata* n. sp.

(Figs. 3 & 4)

Material. Off Seto, Kii Coast; depth and data unlabelled. One specimen.

A small, dirty-white colony (Fig. 3*a*), with short lobate branches thickly beset with incurved polyps, resembling the figure of *E. spiculosa* in KÜKENTHAL (1906, pl. 3, fig. 17), took it for the latter by mere superficial examination. But the spiculation is quite different.

Fig. 3. *Eunephthya serratospiculata* n. sp. *a*, A colony, ×2.7; *b*, polyp, ×27.

The colony attached to sands and shell particles measures up to 2.6 cm in height and 1.8 cm in the maximum spread on its upper branchings. From the top and upper portion of the stem arise a number of short branches consisting each of a solid mass of polyp-bearing lappets. Each lappet bears mostly 5 or 6 incurved polyps grouped closely together. The lower half of the stem, about 1 cm in length, is sterile, and has a diameter of 7 mm at the somewhat shrunken base.

Fig. 4. *Eunephthya serrato-piculata* n. sp. *a*, Tentacle, aboral side, ×67; *b–d*, polyp spicules, showing the serrated appearance on the outer side (left in the figure), ×67; *e–g*, spicules from upper part of stalk, ×80; *h–j*, spicules from basal part of stalk, ×80; *k*, *l*, tentacle spicules, ×150.

The polyps are rather large, club-shaped, and appear very rugose, being thickly armoured with very thorny spicules (Fig. 3*b*). The head is about 1.4–1.7 mm in length and 1.2 mm in diameter. The stalk, shorter than the head, is about 1.0–1.5 mm in length and 0.8–1.0 mm in diameter. The polyp spicules are arranged obliquely, converging into 8 points at the uppermost ends. They

are all thorny spindles, straight or curved; those of the abaxial side are stronger than those on other sides. Each spicule is heavily armed with long and sharp denticles on the outer side, which give it a serrated appearance, while on the inner side it is armed only with minute thorns; the upper end is not sharp, but jagged, and does not project so strongly above the surface as in other species (Fig. 4*b*, *c*).

The general appearance of the polyp armature is thus suggestive of 8 longitudinal sierra-like ridges. The abaxial half of the polyp wall is also armed with spicules to a varying degree, but here the spicules are more slender, sharply ended and set more apart from one another than on the abaxial side. These anthocodial spicules measure: 1.1×0.2 mm; 0.8×0.1 mm; 0.4×0.05 mm.

The tentacles are mostly infolded over the mouth. None are fully expanded, but about 1 mm long tentacle with 10 pairs of long pinnules could be seen. Tentacular spicules, arranged transversely in double rows on the aboral side, are flat rods, measuring 0.06–0.15 mm in length; its abaxial end is blunt, while another end towards the pinnules are dentated (Fig. 4*a*, *k*, *l*). The pinnules are up to 0.45 mm in length and entirely devoid of spicules. At the base of tentacles there are 8 chevroned masses of small thorny spindles up to 0.5×0.05 mm in size which pass almost insensively into those of the crown.

In the upper portion of the stalk, the cortical spicules are arranged transversely. These are all straight or curved thorny spindles with pointed ends and covered with rugged warts or simple thorns (Fig. 4*e*, *f*, *g*). They measure about 0.3×0.03 mm to 1.0×0.07 mm. Towards the basal part of the stalk the spindles become shorter and develop higher warts and thorns, also some small triradiates and small irregular types with jagged thorns measuring up to 0.1 mm across (Fig. 4*h–j*). All these spicules are colorless, only one polyp showing a faint rosy color at the top. The canal-walls seem to be free from spicules.

4. *Eunephthya bicolor* n. sp.

(Plate I; Fig. 5)

Material. Osima, Kii Coast, 8 m deep. One specimen, Collected by Y. Saika. May 4, 1938.

A dark red, flaccid colony, very large for the genus *Eunephthya*.
The colony has three main branches arising erect from a short, sterile,

Fig. 5. *Eunephthya bicolor* n. sp. *a*, Polyp, fully expanded, ×53; *b*, tentacle, aboral side, ×80; *c*, *d*, dark red polyp spicules, ×330; *e*, dark red point spicule, ×330; *f–h*, dark red spicules from branches, ×96; *i*, bright red large spindle from upper part of stalk, ×33; *j*, *k*, white spicules from inner layer of stalk cortex, ×80; *l–o*, red spicules from outer layer of stalk cortex, ×96; *p–r*, flat rods from tentacles, ×330.

common stalk. The total height is about 60 cm of which about 7 cm belongs to the common stalk; the main branches are ca. 20 cm, 33 cm and 40 cm respectively in height. The lateral and terminal twigs which are borne on the primary and secondary divisions of the main branches consist of numerous polyp-bearing terminal lobes.

The common stalk, with a broad basal attachment, is very plump, flaccid and about 10 cm across at the base. The top of the sterile stalk is provided on one side with many foliaceous branches, which form a somewhat continuous collar separating the sterile stalk from the main branches. Thus the growth approaches more nearly to the type of *Dendronephthya* than in most species of *Eunephthya.*

The polyps are closely set in groups on the top of the short-stalked lobes, as many as 10 in a group. They are all fully expanded, non-retractile and distinctly divided into three parts, tentacles, polyp-head and polyp-stalk, by the arrangement and coloration of spicules. The polyps, of medium size, is about 1–2 mm long, excluding the tentacles, and 0.8–1.0 mm wide. The polyp head is somewhat swollen, as long as the stalk or a little shorter. They are slightly curved inwards but not so club-shaped as in the preceding species (Fig. 5*a*).

The polyp head is armoured with 8 converging double rows of dark red spicules (Fig. 5*c*, *d*). Towards the stalk the polypal spicules become larger in size and somewhat irregular and sparse in arrangement and insensibly merge into those of the branch cortex. These spicules are all spindles with simple rounded warts and rounded ends; they measure as follows:

Polyp head	0.08×0.02 mm; 0.16×0.03 mm.
Polyp stalk	0.07×0.02 mm; 0.22×0.04 mm.

On the uppermost part of the head there are smaller, up to 0.06 mm long, red-colored point spicules (Fig. 5*e*), which are arranged longitudinally and converging into the base of tentacles. The development of these polypal spicules is symmetrical on all sides.

The polyps arising from the lower part of the main branches and the foliaceous collar at the top of the sterile stalk are, however, pure orange; this gradually merges downwards into a white or red color. This is due to the coloration of the spicules of polyps and branch cortex. These orange-colored polyps are usually somewhat smaller than the red-colored polyps.

The tentacles in a fully expanded state are about 1 mm in length by 0.28 mm in basal breadth and bear mostly 14 long pinnules on each side. They are translucent and bear on the aboral side very numerous small spicules, arranged transversely, but not forming any regular row (Fig. 5*b*). These tenta-

cle spicules are white, flat rodlets with dentate margin, measuring 0.04–0.06mm in length and 0.015–0.018 mm in width (Fig. 5*p–r*). Often one or a few rodlets are also seen between the bases of pinnules, but not on the pinnules themselves. This is similar in both polyps of different coloration mentioned above.

The cortex of the main branch and stalk shows apparently two-layered spiculation with different coloration as follows:

(*a*) Smaller, dark-red spindles with simple or forked warts; 0.2×0.06mm, 0.6×0.03 mm, 0.9×0.1 mm. These form the great majority and superficial layer (Fig. 5*f–h*).

(*b*) Larger, bright red spindles with minute simple warts and pointed ends; 1.5×0.2 mm, 2.0×0.24 mm, 2.4×0.3 mm, 3.5×0.5 mm, 4.0×0.4 mm. These lie somewhat deeper and sparsely (Fig. 5*i*).

Downwards the color of the cortical spicules becomes paler and whitish, especially below the collar surrounding the base of main branches. But at the base of the common stalk again it becomes more reddish, and here the spiculation is generally similar to that of the upper part. However, various types of spicules derived from the spindles are also found as follows:

(*a*) The outer layer consists of numerous, small, white or reddish thorny rods, clubs and capstans; 0.1×0.05 mm, 0.2×0.13 mm, 0.3×0.16 mm. (Fig. 5 *l-o*).

(*b*) The inner layer consists of few, white stout warty spindles, clubs, triradiates, quadriradiates or irregular stellate forms with large compound warts; 0.2×0.04 mm, 0.5×0.12 mm. (Fig. 5*j–k*).

When the outer and inner layers of the cortex is indistinct, the latter spicules are sparsely scattered between the colored smaller ones. In the canal-walls there is no spicule whatever.

In the ramification of the colony and large size, this species is most like *Litophyton* (=*Lithophytum*), a Nephthyid genus commonly known from tropical shallow waters, while in the spiculation it is more nearly related to cold-water form *Eunephthya* than to the former. The spicular arrangement of the anthocodia is, however, more regular and symmetrical on all sides than in other known species of *Eunephthya* as well as the above described three species. It differs from all other *Eunephthya*-species in the colony form, especially the formation of the foliaceous collar on the top of the stalk, like that of some species of *Dendronephthya*. But for the present I provisionally retain this species in the genus *Eunephthya*.

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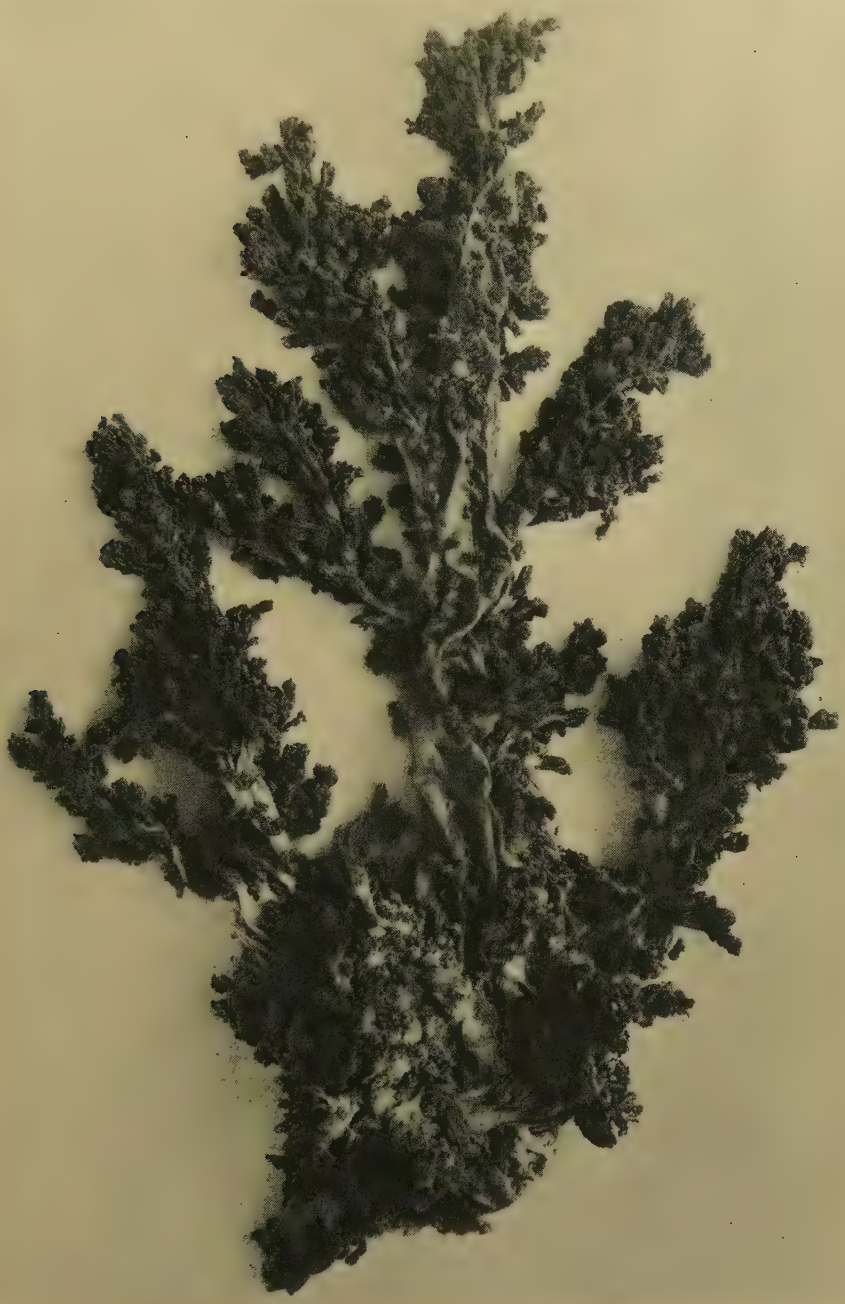
(* not seen directly.)

EXPLANATION OF PLATE I

Fig. 1. *Eunephthya bicolor* UTINOMI (n. sp.) ×1/4.



H. Utinomi ; *Eunephthya* from Middle Japan

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Illustrated Catalogue of Japanese Shells
Edited by Dr. Tokubei Kuroda

September 10, 1951 Petricolidae ; Cardiliidae ; Anatinellidae No. 15.

日本産イハホリガヒ科・キサガヒモドキ科・チトセノハナガヒ科

波 部 忠 重

Petricolidae, Cardiliidae and Anatinellidae in Japan

by

Tadashige HABE

Family Petricolidae イハホリガヒ科

Genus *Lajonkairia* Deshayes 1854 チヂミガヒ屬

1854 *Lajonkairia* Deshayes, Cat. Conchif. Brit. Mus., p. 217.

Type species: *Venerupis decussata* Philippi (=*Venerupis lajonkairii* Payraudeau (tautonymy)

1. *Lajonkairia divaricata* (Lischke) チヂミガヒ

Pl. 15, figs. 1, 2, 3.

1872 *Lucinopsis divaricata* Lischke, Mal. Bl., **19**, p. 108.

1874 *Lucinopsis divaricata* Lischke, Jap. Meeres Conchyl., **3**, p. 90, pl. 7, figs. 12, 13, 14.

1922 *Lucinopsis divaricata* Yokoyama, Jour. Coll. Sci. Imp. Univ. Tokyo, **44** (1), p. 145, pl. 10, fig. 7.

1923 *Lajonkairia divaricata* Lamy, Jour de Conchyl., **67**, p. 312.

Length 15.8 mm., height 14.4 mm., breadth 8.8 mm. (figured specimen collected from Suiken in Wakayama city by K. Ito)

Type locality: Japan (Tokyo Bay)

Distribution: Honshu

Genus *Petricolirus* nov. シホツガヒ屬

This new genus is distinguished from *Petricolaria* Stoliczka 1871 in having the numerous subequal radial striae all over the surface and the posterior extremity which is truncated obliquely.

Type species: *Petricola aequistriata* Sowerby

SETO MARINE BIOLOGICAL LABORATORY
(Sirahama, Wakayama-ken, Japan)
Contribution No. 168

2. *Petricolirus aequistriatus* (Sowerby) シホツガヒ

Pl. 15, figs. 4, 5.

1874 *Petricola aequistriata* Sowerby, Conch. Icon., sp. 19.

1910 *Petricolaria aequistriata* Jukes-Browne, Proc. Malac. Soc. London, **10**, p. 218.

1922 *Venerupis semipurpurea* Yokoyama, Jour. Coll. Sci. Imp. Univ. Tokyo, **44** (1), p. 151, pl. 12, figs. 1, 2, non Dunker 1882.

Length 36.5 mm., height 19.4 mm., breadth 15.4 mm. (figured specimen collected from Akashi, Hyogo Pref. by T. Kuroda).

Type locality: ——.

Distribution: Kyushu; Shikoku and Honshu (Northern limits: Bôsô Peninsula on the Pacific coast and the Toyama Bay on the Japan Sea coast).

Genus *Ruppellaria* Fleuriau de Bellevue 1802 クシケガヒ屬

1802 *Ruppellaria* Fleuriau de Bellevue, Jour. d. Physique, **54**, p. 347.

1844 *Choristodon* Jonas, Zeitschr. f. Malak., p. 185.

Type species: *Petricola lithophaga* Retzius

3. *Ruppellaria fabagella* (Lamarck) クシケガヒ

Pl. 15, figs. 7, 8.

1818 *Petricola fabagella* Lamarck, Anim. s. Vert., **5**, p. 505.

1854 *Petricola chinensis* Sowerby, Thes. Conch, **2**, p. 768, pl. 164, fig. 13.

1901 *Petricola cyclas* Pilsbry, Proc. Acad. Nat. Sci. Phila., **53**, pp. 204, 400, pl. 19, figs. 3, 4.

1901 *Petricola cyclas sculpturata* Pilsbry, *l. c.*, pp. 205, 400, pl. 19, fig. 7.

1921 *Petricola fabagella* Lamy, Bull. Mus. Hist. Nat., **27**, p. 436.

1923 *Petricola fabagella* Lamy, Jour. de Conchyl., **67**, p. 328, pl. 3, fig. 9.

Length 29.3 mm., height 21.6 mm., breadth 18.0 mm. (figured specimen collected from Prov. Hizen (=Nagasaki Pref.), Kyushu.

Type locality: Nouvelle Hollande (Northern Australia).

Distribution: Indo-Pacific region; Kyushu; Shikoku and Honshu.

Genus *Petricola* Lamarck 1801 イハホリガヒ屬

1801 *Petricola* Lamarck, Syst. Anim. s. Vert., p. 121.

1853 *Naranio* Gray, Ann. Mag. Nat. Hist., (2) **11**, p. 38.

Type species: *Venus lapicida* Chemnitz (designated by Schmidt 1818)

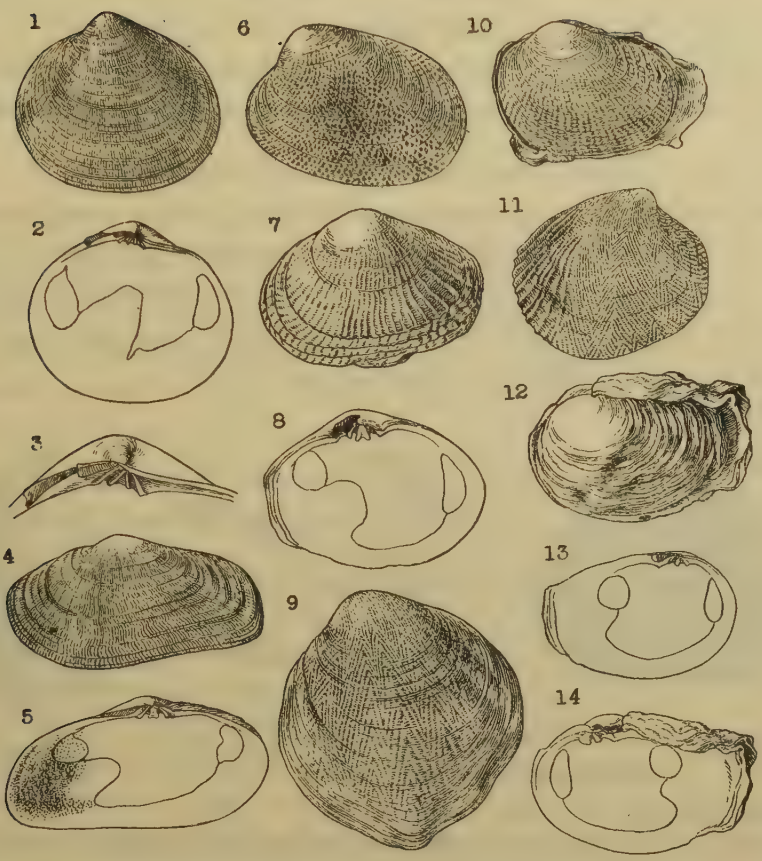
4. *Petricola divergens* (Gmelin) イハホリガヒ

Pl. 15, figs. 6, 11.

1791 *Venus divergens* Gmelin, Syst. Nat., ed. 13, p. 3269.

1801 *Petricola costata* Lamarck, Syst. Anim. s. Vert., p. 121.

Plate 15. Petricolidae



Figs. 1, 2, 3. *Lajonkairia divaricata* (Lischke) チヂミガヒ, 15.8 mm. × 14.4 mm. p. 95
4, 5. *Petricolirus aequistriatus* (Sowerby) シホツガヒ, 36.5 mm. × 19.4 mm. p. 96
6, 11. *Petricola divergens* (Gmelin) イハホリガヒ, 17.3 mm. × 12.2 m.m. and 19.2 mm. × 16.4 mm. p. 96
7, 8. *Ruppellaria fabagella* (Lamarck) クシケガヒ, 29.3 mm. × 21.6 mm. p. 96
9. *Pseudoirus mirabilis* (Deshayes) チヂミイハホリガヒ, 16.3 mm. × 16.8 mm. p. 98
10. *Claudiconcha monstrosa* (Gmelin) ヌノメセミアサリ, 21.5 mm. × 15.0 mm. p. 99
12, 13, 14. *Claudiconcha japonica* (Dunker) セミアサリ, 22.2 mm × 14.0 mm. p. 99

1818 *Petricola lucinalis* Lamarck, Anim. s. Vert., **5**, p. 45.

1853 *Naranio radiata* Gray, Ann. Mag. Nat. Hist., **11**, p. 38.

1854 *Naranio radiata* Deshayes, Cat. Conchif. Brit. Mus, p. 216.

1854 *Petricola divaricata* Sowerby, Thes. Conch., **2**, p. 776, pl. 166, figs. 24, 25.

1874 *Petricola divaricata* Sowerby, Conch. Icon, sp. 22.

1922 *Petricola laticida* Lamy, Jour. de Conch., **67**, p. 337.

1923 *Petricola divergens* Prashad, Siboga Exped., Lamellibr., p. 264.

Length 19.2 mm., height 16.4 mm., breadth 11.2 mm. (figuree specimen collected from Shikoku by J. Murakami).

Type locality: Insulas Americae mediae obverfas (probably an error)

Distribution: Indo-Pacific region; Ryukyu and Amami groups and Shikoku.

Genus *Pseudoirus* nov. チヂミイハホリガヒ属

Shell rather thick, compressed, variable in shape, striated divergently partly or all over the shell, white with brownish radial patterns posteriorly; cardinals strong, 2 on the right valve and 3 on the left; interior of valves white, except for the dark brown postero-dorsal area; pallial sinus round and deep.

Type species: *Venerupis mirabilis* Deshayes

Textfigs. 15–19. 15. *Pseudoirus mirabilis* (Deshayes) チヂミイハホリガヒ×2, 16–19. *Cardilia semisulcata* (Lamarck) キサガヒモドキ×2.

Remarks: This new genus differs from *Petricola* in having the compressed shell, which is stained brownish at its postero-dorsal area. It does not burrow in corals.

5. *Pseudoirus mirabilis* (Deshayes) チヂミイハホリガヒ

Pl. 15, fig. 9 and textfig. 15.

1853 *Venerupis mirabilis* Deshayes, Cat. Conch. Brit. Mus., p. 207.

1854 *Venerupis mirabilis* Sowerby, Thes. Conch., 2, p. 766, pl. 165, fig. 24.

1871 *Petricola mirabilis* Lischke, Jap. Meeres Conchyl., 2, p. 122.

1874 *Venerupis mirabilis* Sowerby, Conch. Icon., sp. 4.

1922 *Petricola mirabilis* Lamy, Jour. de Conchyl., 67, p. 284, 341.

Length 19.3 mm., height 15.5 mm., breadth 9.5 mm. (figured specimen collected from Suiken in Wakayama city).

Type locality: Monterey Bay, California (probably an error)

Distribution: Kyushu; Shikoku and Honshu.

Genus *Claudiconcha* Fischer 1887 ヌノメセミアサリガヒ屬

1887 *Claudiconcha* Fischer, Man. Conchyl., p. 1887.

Type species: *Venus monstrosa* Gmelin (monotypy)

6. *Claudiconcha monstrosa* (Gmelin) ヌノメセミアサリガヒ

Pl. 15, figs. 12, 13, 14.

1791 *Venus monstrosa* Gmelin, Syst. Nat., ed. 13, p. 3280.

1854 *Veneruptis monstrosus* Sowerby, Thes. Conch., **2**, p. 768, pl. 164, fig. 13.

1869 *Ruptellaria monstrosa* A. Adams, Ann. Mag. Nat. Hist., (4) **3** (15), p. 236.

1934 *Petricola monstrosa* Kuroda, Venus, **4** (6), p. 188, figs. 20, 21, 22.

Length 21.5 mm., height 15.0 mm., breadth 5.0 mm. (figured specimen collected from Ryukyu by A. Teramachi).

Type locality: Nicobar Islands.

Distribution: Indo-Pacific region; Ryukyu and Amami groups.

7. *Claudiconcha japonica* (Dunker) セミアサリ

Pl. 15, figs. 12, 13, 14.

1882 *Petricola japonica* Dunker, Index Moll. mar. Japon., p. 209, pl. 9, figs. 4, 5 6.

1923 *Petricola japonica* Lamy, Jour. de Conchyl., **67**, p. 355.

1923 *Petricola japonica circumdata* Lamy, *l. c.*, p. 356, textfig.

1934 *Petricola japonica* Kuroda, Venus, **4** (6), p. 388, figs. 17, 18, 19.

Length 22.2 mm., height 14.0 mm. breadth 10.5 mm. (figured specimen collected from Shirahama, Wakayama Pref.)

Type locality: Kisenuma, Pacific Coast of Japan.

Distribution: Formosa to Honshu.

Family Cardiliidae キサガヒモドキ科

Genus *Cardilia* Deshayes 1835 キサガヒモドキ屬

1835 *Cardilia* Deshayes, Anim. s. Vert., ed. 2, **6**, p. 448.

Type species: *Cardilia semisulcata* (Lamarck) (monotypy)

1. *Cardilia semisulcata* (Lamarck) キサガヒモドキ

Textfigs. 16—19.

1819 *Isocardia semisulcata* Lamarck, Anim. s. Vert., **6** (1), p. 32.

1873 *Cardilia semisulcata* Sowerby, Conch. Icon., sp. 1.

1882 *Cardilia semisulcata* Dunker, Index Moll. Mar. Japon., p. 213, pl. 8, figs. 1–3.

1918 *Cardilia semisulcata* Lamy, Jour. de Conchyl., **63**, p. 410 and textfigs. on p. 409.

1927 *Cardilia semisulcata* Yokoyama, Jour. Fac. Sci. Imp. Univ. Tokyo, (2) 1 (10), p. 425, pl. 48, fig. 16.

Length 11.8 mm., height 17.0 mm., breadth 14.5 mm. (conjoined valves) (figured specimen collected from Noto Peninsula, Honshu).

Type locality: Nouvelle Hollande (Northern Australia)

Distribution: Indo-Pacific region; China; Formosa; Kyushu Shikoku and Honshu.

Family Anatinellidae チトセノハナガヒ科

Genus *Anatinella* Sowerby 1833 チトセノハナガヒ屬

1833 *Anatinella* Sowerby, Genera Shells, part 40.

Type species: ***Anatinella sibbaldii*** Sowerby (monotypy)

1. *Anatinella nicobarica* (Gmelin) チトセノハナガヒ

Textfigs. 20, 21.

1791 *Mya nicobarica* Gmelin, Syst. Nat., ed. 13, p. 3221.

1833 *Anatinella sibbaldii* Sowerby, Genera Shells, pt. 40 (name on plate).

1850 *Anatinella candida* Deshayes, Traité élém. Conch., **1** (2) 2, p. 292.

1873 *Anatinella siebbaldii* Sowerby, Conch. Icon., sp. 1.

1873 *Anatinella candida* Sowerby, Conch. Icon., sp. 2.

1918 *Anatinella nicobarica* Lamy, Jour. de Conchyl., **63**, p. 406.

Length 30.0 mm., height 23.6 mm., depth 6.4 mm. (figured specimen collected from Kagoshima Pref., Kyushu by A. Teramachi).

Type locality: Islands of Nicobar.

Distribution: Indo-Pacific region; China; Okinawa and Kyushu.

Textfigs. 20, 21. *Anatinella nicobarica* (Gmelin) チトセノハナガヒ

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Illustrated Catalogue of Japanese Shells
Edited by Dr. Tokubei Kuroda

December 10, 1951 Marginellidae, Hydrocenidae No. 16.

日本産コゴメガヒ科及びゴマヲカタニシ科

波 部 忠 重

Marginellidae and Hydrocenidae in Japan

by

Tadashige HABE

Family Marginellidae コゴメガヒ科

Genus *Volvarina* Hinds 1844. マクラコゴメガヒ屬

1844 *Volvarina* Hinds, Proc. Zool. Soc. London, p. 75.

Type species: ***Marginella nitida*** Hinds (monotypy)

1. *Volvarina hirasei* (Bavay) マクラコゴメガヒ

Textfig. 1.

1909 *Marginella* (*Volvaria*) sp., Conch. Mag., **3**, p. 4, pl. 1, figs. 3, 4.

1917 *Marginella* (*Volvaria*) *hirasei* Bavay, Jour. de Conchyl., **63**, p. 106, pl. 2, fig. 8.

Length 6.0mm., breadth 2.5mm. (figured specimen collected from Tokunoshima, Amami group).

Type locality: Kikaigashima, Amami group.

Distribution: Okinawa and Amami groups.

Genus *Volvarinella* nov. フタスヂコゴメガヒ屬

Shell rather small, elongate rhomboidal to fusiform in shape; apex obtuse; spire distinct, with 4 or 4½ whorls, generally ornamented with three or four colour bands on the body whorl which is large; aperture elongate, somewhat widen below; one or several weak denticulations on the inside of the outer margin and four folds on the columellar wall.

Type species: ***Volvarinella makiyamai*** sp. nov.

Remarks: This new genus differs from *Volvarina* in having the toothed

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Contribution No. 169

outer margin and in much more elevated spire. *Serrata* Jousseaume[1] is an allied group, but may be distinguished from the present new genus in the far distinctly and densely crenulated outer margin.

2. *Volvarinella neglecta* (Sowerby) イリコゴメガヒ

Textfig. 5.

1846 *Marginella neglecta* Sowerby, Thes. Conch., 1, p. 390, pl. 76, figs. 135, 136.

Length 6.1mm., breadth 2.5mm. (figured specimen collected from Kakeromajima, Amami group by R. Kawamura)

Type locality: ——.

Distribution: Okinawa and Amami groups.

3. *Volvarinella makiyamai* sp. nov. フタスヂコゴメガヒ

Textfig. 10.

Shell small, elongate rhomboidal, semitranslucent and polished, decorated with four brown bands on the yellowish green ground colour: the first below the suture, the second on the periphery and the broadest, the third on the base and the fourth tinted the anterior extremity; whorls 4 or 4½; apex obtuse; the body whorl large, containing about four-fifths in the whole shell length; aperture rather narrow, widen below; outer margin thickened, with one or two indistinct teeth on its inner side; columellar margin bearing four subequal folds.

Length 4.4mm., breadth 2.2mm. (figured type specimen).

Type locality: Shirahama, Wakayama Pref., Honshu.

Distribution: Honshu (type locality) and Amami group.

Remarks: This was recorded as *Marginella binotata* Sykes[2] by some authors from Japan, but our species may be easily distinguished from that species in the nature of the colouration of bands and the apex never tinted.

4. *Volvarinella kawamurai* sp. nov. ミドリコゴメガヒ

Textfig. 7.

Shell small, fusiform, thin, smooth and polished, pale yellow to green, without any colour bands; spire distinct; whorls about 4½, with an obtuse apex; body whorl large, containing about four-fifths in the shell length; aperture narrow, but somewhat dilated below; one distinct tooth on the upper part of the outer margin and four folds on the columellar margin.

---

(1) *Serrata* Jousseaume 1875, Rev. Mag. Zool., 3 (3), pp. 167, 230—232 (Type species: *Marginella serrata* Gaskoin).

(2) *Marginella binotata* Sykes, Proc. Malac. Soc. London, 6, p. 316, pl. 17, fig. 5 (1905).

Length 3.6mm., breadth 1.8mm. (figured type specimen).

Type locality: Kakeromajima, Amami group.

Distribution: Okinawa and Amami groups.

Remarks: *Marginella ringicula* Sowerby[3] from the Philippines is a closely allied species, but that is a small and uniformly white species which has several teeth on the inside of outer margin.

Genus *Kogomea* nov. コゴメガヒ屬

Shell small, elongate ovate, white to pale brown, rather solid, smooth and shining; whorls 4 to 5; body whorl large, contracted below; aperture narrow, with the densely crenulated outer margin and four or five folds on the columellar lip which are gradually decreasing the sizes upwardly.

Type species: *Marginella novemprovincialis* (Yokoyama).

Remarks: For this group *Cystiscus* Stimpson 1865 has been used by some authors from Japan, but it is easily separable from that in having the crenulated outer margin and no dilation of the callous on the columellar margin.

5. *Kogomea novemprovincialis* (Yokoyama) リウグウコゴメガヒ

Textfig. 11.

1928 *Erato novemprovincialis* Yokoyama, Jour. Fac. Sci. Imp. Univ. Tokyo, (2) **2** (7), p. 346, pl. 67, fig. 7.

Length 3.4mm., breadth 2.3mm. (figured specimen from off Mihama in the Suruga Bay; Soyo-maru Station No. 259, 188m. in depth).

Type locality: Kounji, Takanabe-cho, Miyazaki Pref. (Prov. Hyuga), Kyushu (fossil).

Distribution: Off Hamamatsu, Shizuoka Pref. (Soyo-maru Station No. 390, 24～38m. in depth); off Shimoda, Izu Peninsula (Soyo-maru Station No. 255, 263m. in depth) and off Nagasaki (Soyo-maru Station No. 433, 168m. in depth) and Tosa, Shikoku.

6. *Kogomea ovata* sp. nov. タマゴナリコゴメガヒ

Textfig. 6.

Shell small, solid, elongate ovate, white to pale brown, smooth and polished; spire very low; whorls distinct, about 4; body whorl very large, constricted below; aperture narrow and outer margin provided by many minute denticulations on its inside and four or five folds on the columellar margin.

---

(3) *Marginella ringicula* Sowerby, Proc. Malac. Soc. London, 4, p. 126, pl. 11, fig. 3 (1900).

(4) *Cystiscus* Stimpson 1865, Amer. Jour. Conch., 1, p. 55 (Type species: *Cystiscus capensis* Stimpson).

Length 3.8mm., breadth 2.7mm. (figured type specimen).

Type locality: Kakeromajima, Amami group.

Distribution: Wakayama Pref., Honshu and Amami group.

Remarks: This species was reported as *Marginella sueziensis* Issel[5] from Japan, but may be distinguished from that species in the more obtuse shoulder angle and the broader diameter.

Textfigs. 1–11. 1. *Volvarina hirasei* (Bavay) マクラコゴメ, 2. *Microvulina nipponica* sp. nov. ツユダマガヒ, 3. *Microvulina nanaoensis* sp. nov. チビツユダマガヒ, 4. *Cypraeolinacotamago* (Yokoyama) キザミタカラコゴメ, 5. *Volvarinella neglecta* (Sowerby) イリコゴメ, 6. *Kogomea ovata* sp. nov. タマゴナリコゴメ, 7. *Volvarinella kawamurai* sp. nov. ミドリコゴメ, 8. *Cypraeolina horikosii* sp. nov. タカラコゴメ, 9. *Kogomea japonica* (Nomura et Hatai) コゴメガヒ, 10. *Volvarinella makiyamai* sp. nov. フタスヂコゴメ, 11. *Kogomea novemprovincialis* (Yokoyama) リウグウコゴメガヒ.

7. *Kogomea japonica* (Nomura et Hatai) コゴメガヒ

Textfig. 9.

1940 *Hyalina japonica* Nomura et Hatai, Saito Ho-on Kai Mus., Res. Bull. 19, p. 69, pl. 3, figs. 12a, b.

Length 3.0mm., breadth 2.0mm. (figured specimen collected from Shirahama, Wakayama Pref., Honshu).

---

(5) *Marginella sueziensis* Issel, Mal. Mar. Rosso., p. 115 (1869).

Type locality: Kyurokujima, Aomori Pref., Honshu.

Distribution: Honshu.

Remarks: The writer has identified the specimen figured here as conspecific with this species, however, the type specimen of this species which is deposited in the Saito Ho-on Kai Museum has been studied by the writer years ago, finding that the type specimen was a somewhat immature individual and the denticulated outer margin has not yet been formed. This species has formerly been recorded as *Marginella sandwicensis* Pease[6] by some Japanese authors.

Genus *Microvulina* nov. ツユダマガヒ属

Shell small, ovate to spherical, smooth and polished; spire very low, sometimes sunken and covered by the callous of the upper margin; aperture narrow; outer margin thickened, without crenulations; columellar margin with four or a little more folds; they are decreasing the sizes upwardly.

Type species: *Microvulina nipponica* sp. nov.

8. *Microvulina nipponica* sp. nov. ツユダマガヒ

Textfig. 2.

Shell very small, sphaeric ovate, solid, white, smooth and shining; spire very low; whorls 4, covered by the callous of the dilation of upper margin: aperture narrow; outer lip thickened, exceeding further the apex at the upper margin; columellar folds about 6 in number, decreasing the sizes upwardly.

Length 2.8mm., breadth 2.0mm. (figured type specimen).

Type locality: Okinoshima, Kochi Pref., Shikoku.

Distribution: Honshu; Shikoku; Kyushu; Amami and Okinawa groups.

9. *Microvulina nanaoensis* sp. nov. チビツユダマガヒ

Textfig. 3.

Shell minute, ovate, reducing the diameter below, white (yellow in dead specimens), rather thin, smooth and polished; whorls 3, nearly flat; aperture narrow, the upper part of outer margin exceeds the apex, without any denticulation inside; columella bears 4～6 folds, gradually decreasing the sizes upwardly.

Length 2.0mm., breadth 1.3mm. (figured type specimen).

Type locality: The entrance of Nanao Bay, Noto Peninsula on the Japan Sea coast of Honshu.

---

(6) *Marginella sandwicensis* Pease, Proc. Zool. Soc. London, p. 147 (1860).

Distribution: Type locality and Shirahama, Wakayama Pref., Honshu.

Remarks: This was formerly recorded as *Marginella occulta* Monterosato by some authors from Japan, but may not be the latter species.

Genus *Cypraeolina* Cerulli-Irelli 1911 キザミタカラコゴメガヒ屬

1911 *Cypraeolina* Cerulli-Irelli, Palaeontographia Italica, Mem. Paleont., **17**, p. 231, pl. 21, figs. 9—14.

1921 *Merovia* Dall, U. S. Nat. Mus., Bull. 112, p. 86.

Type species: *Cryptospira Clandestina* Brocchi (mono type).

10. *Cypraeolina cotamago* (Yokoyama) キザミタカラコゴメガヒ

Textfig. 4.

1922 *Marginella cotamago* Yokoyama, Jour. Coll. Sci. Imp. Univ. Tokyo, **44** (1), p. 49, pl. 2, fig. 6.

1922 *Marginella perovulina* Yokoyama, *l. c.*, p. 49, pl. 2, fig. 7.

Length 2.6mm., breadth 1.7mm. (figured specimen from off Tsushima).

Type locality: Shito, Ichihara-gun, Chiba Pref., Honshu (fossil).

Distribution: Off Tsushima (Soyo-maru Station No. 459, 115m. in depth and No. 469, 91m. in depth); off Oki Islands in the Japan Sea (Soyo-maru Station No. 503, 146m. in depth) and Shikoku; Moeshima in the Kagoshima Bay, Kyushu (Pleistocene fossil).

Remarks: *Cypraeolina solida* Makiyama[8] is an allied fossil form.

11. *Cypraeolina horikosii* sp. nov. タカラコゴメガヒ

Textfig. 8.

Shell minute, oblong ovate, white, solid, smooth and shining; spire concealed; aperture narrow, as long as the shell length; outer margin thickened and minutely crenulated within; four or five folds on the columellar margin decreasing the sizes upwardly.

Length 3.0mm., breadth 2.0mm. (figured type specimen).

Type locality: Shirahama Pref., Honshu.

Distribution: Honshu (Wakayama Pref. to Sagami Bay and Kyurokujima in the Japan Sea) and Kyushu (Fukuoka).

12. *Volvarinell teramachii* sp. nov. テラマチコゴメガヒ

Textfig. 12.

Shell rather small, oblong ovate, semitranslucent, greyish white; body whorl with three or four bands of pale orange colour, which are narrow but

(7) *Marginella occulta* Monterosato, Test. Nouv. Mar. Sicil, p. 17, fig. 10 (1869).

(8) *Cypraeolina solida* Makiyama, Mem. Coll. Sci. Kyoto Imp. Univ., (B) 3 (1), p. 83, pl. 4, fig. 1 (1927).

Textfig. 12.
Volvarinella teramachii sp. nov.
テラマチコゴメ

indistinct in front; surface smooth and shining; spire elevated; whorls 4½, with a well marked suture; apex blunt; body whorl large, as long as two thirds of the wholeshell length; aperture elongate, with the outer margin thickened, denticulate within, the superior one of the teeth being the most prominent; columellar margin armed with four folds, decreasing the sizes upwardly.

Length 5.8mm., breadth 2.8mm., (figured type specimen).

Type locality: Okinawa (Collected by A. Teramachi).

Remarks: *Marginella binotata* Sykes[8] is the most allied one to the present new species in shape and denticulation of the outer margin, but may be distinguished from the latter in having only two broad colour bands on the body whorl. *Marginella pusilla* H. Adams[9] from Mauritius is another allied one.

Marginella sexplicta Dunker (syn. *Marginella obtusa* Sowerby 1870 non 1840) has been reported by Dunker from Japan, but seems to be erroneous. *Volvaria sexplicata* Risso 1826 does not invalidate *Marginella sexplicata* Dunker 1871 as homonym, but *Persicula grisea* Jousseaume 1875 is a synonym of the latter.

Family Hydrocenidae ゴマヲカタニシ科

Genus *Georissa* Blanford 1864 ゴマヲカタニシ屬

1864 *Georissa* Blanford, Ann. Mag. Nat. Hist., (3) **13**, p. 463.

Type species: *Hydrocena sarrita* Benson.

Subgenus *Georissa* s. s. ゴマヲカタニシ亞屬

1. *Georissa japonica* Pilsbry ゴマヲカタニシ

Textfig. 1.

1900 *Georissa japonica* Pilsbry, Proc. Acad. Nat. Sci. Phila., **52** p. 384.

1901 *Georissa japonica* Moellendorff, Nachr-bl. Malak. Ges., **33** (3, 4), p. 45.

1907 *Georissa japonica* Hirase, Conch. Mag., **1** (4), pl. 4, fig. 49.

1951 *Georissa japonica* Is. Taki, Hirase's Handbook Illust. Shells, pl. 131, fig. 5.

Length 2.2mm., breadth 1.8mm. (figured specimen collected from Ishigasato Okayama Pref. by Hiroshi Koyano).

Type locality: Kashima, Prov. Harima (=Hyogo Pref.), Honshu.

Distribution: Honshu; Shikoku; Kyushu and Okinawa.

---

(9) *Marginella pusilla* H. Adams, Proc. Zool. Soc. London, p. 303, pl. 19, fig. 1.

Subgenus *Petrorissa* Kuroda et Habe 1949 ベニゴマヲカタニシ亞屬

1949 *Petrorissa* Kuroda et Habe, Katatsumuri (Helicacea), p. 23.

Type species: *Georissa shikokuensis* Amano (original designation).

Textfigs. 1, 2. 1. *Georissa japonica* Pilsbry ゴマヲカタニシ
2. *Georissa* (*Petrorissa*) *shikokuensis* Amano
ベニゴマヲカタニシ

2. *Georissa* (*Petrorissa*) *shikokuensis* Amano ベニゴマヲカタニシ

Textfig. 2.

1939 *Georissa shikokuensis* Amano, Volumen Tubilare pro Professore Sadao Yoshida, **1**, p. 675, textfig. 6.

1941 *Georissa shikokuensis* Is. Taki, Hirase's Handbook Illust. Shells, pl. 131, fig. 6.

Length 2.2mm., breadth 1.7mm. (figured specimen collected from Tairyuji, Tokushima Pref.).

Type locality: Mt. Ishimaki, Aichi Pref., Honshu.

Distribution: Shikoku (Ryuga-do, Kochi Pref. and Tairyuji, Tokushima Pref.) and Honshu (Shirasaki, Wakayama Pref. and Akiyoshi, Yamaguchi Pref.).

Remarks: This species is one of the endemic species of limestone regions in Japan.

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Illustrated Catalogue of Japanese Shells
Edited by Dr. Tokubei Kuroda

December 25, 1951 Fissurellidae No. 17.

日本産スカシガヒ科 (1)

波部忠重

Fissurellidae in Japan (1)

by

Tadashige Habe

Family Fissurellidae スカシガヒ科

Genus *Macroschisma* Sowerby 1839 スカシガヒ属

1839 *Macroschisma* Sowerby, Conch. Illust., *Fissurella*, p. 5, no. 45.

1840 *Machrochisma* Swainson, Treat. Malac., p. 356.

1851 *Macrochisma* A. Adams, Proc. Zool. Soc. London, p. 202 (1850).

1940 *Dolichoschisma* Iredale, Austr. Zool., **9** (4), p. 431.

Type species: *Fissurella macroschisma* Sowerby (=*Patella macroschisma* Humphrey) (monotypy).

Macroschisma sinensis A. Adams スカシガヒ

Pl. 17, fig. 25.

1817 *Patella macroschisma* Dillwyn, Descript. Cat. Rec. Shells, **2**, p. 1062, non Humphrey 1786.

1851 *Macrochisma maxima* A. Adams, Proc. Zool. Soc. London, p. 202 (1850), non *Fissurella maxima* Sowerby (=*Macroschisma maxima* Sowerby 1839).

1855 *Macrochisma sinensis* A. Adams, Proc. Zool. Soc. London, p. 122.

1862 *Macrochisma maxima* Sowerby, Thes. Conch., **3**, p. 205, pl. 244, figs. 216, 217.

1862 *Macrochisma sinensis* Sowerby, *l. c.*, p. 205, pl. 244, fig. 219.

1867 *Macrochisma sinensis* A. Adams, Proc. Zool. Soc. London, p. 312, pl. 19, fig. 28.

1890 *Macroschisma sinensis* Pilsbry, Man. Conch., **12**, p. 190, pl. 59, figs. 57—59.

1890 *Macroschisma maxima* Pilsbry, *l. c.*, p. 192, pl. 62, fig. 22.

1891 *Macroschisma macroschisma* Thiele, Das Gebiss der Schnecken, **2**, p. 302, pl. 27, fig. 26.

1895 *Macroschisma sinensis* Pilsbry, Cat. Mar. Moll. Japan, p. 108, pl. 6, figs. 6-8.

SETO MARINE BIOLOGICAL LABORATORY
(Sirahama, Wakayama-ken, Japan)
Contribution No. 171

1908 *Macroschisma maxima* Schepman, Siboga Exped., **39**, Monogr. 49a, p. 84.

1920 *Macroschisma sinensis* Yokoyama, Jour. Coll. Sci. Imp. Univ. Tokyo, **39** (6), p. 96, pl. 6, fig. 3.

1922 *Machroschisma sinensis brevis* Yokoyama, Jour. Coll. Sci. Imp. Univ. Tokyo, **44** (1), p. 115, pl. 6, fig. 3 (*laevis* sic. on the explanatory text.)

1942 *Macroschisma maxima* Yen, Proc. Malac. Soc. London, **24**, p. 176.

1942 *Macroschisma sinensis* Yen, *l.c.*, p. 177, pl. 11, fig. 10.

1945 *Macroschisma sinensis* Habe, Jap. Jour. Malac., (Venus), **14**, (1—4), p. 2., fig. 6.

1947 *Macroschisma sinensis* Hirase, Illust. Encycl. Fauna Japan, (rev. ed.), p. 1195, fig. 3404.

1951 *Machrochisma macroschisma* Is. Taki, Hirase's Handb. Illust. Shells, pl. 62, fig. 3.

Length 25.8 mm., breadth 11.9 mm., height 7.1 mm. (figured specimen collected from Bôsô Peninsula).

Type locality: China seas.

Distribution: East Indies; China; Kyushu; Shikoku and Honshu.

Macroschisma dilatata A. Adams ヒラスカシガヒ

Pl. 17, fig. 27.

1851 *Macrochisma dilatata* A. Adams, Proc. Zool. Soc. London, p. 203 (1850).

1862 *Macrochisma dilatata* Sowerby, Thes. Conch., **3**, p. 206, pl. 6, fig. 220.

1890 *Macroschisma dilatata* Pilsbry, Man. Conch, **12**, p. 193, pl. 59, fig. 63.

1894 *Macroschisma lischkei* Pilsbry, Nautilus, **8**, p. 29.

1895 *Macroschisma lischkei* Pilsbry, Cat. Mar. Moll. Japan, p. 108, pl. 6, figs. 1–5.

1951 *Machrochisma dilatata* (+*dilatata lischkei*) Is. Taki, Hirase's Handb. Illust. Shells, pl. 62, figs. 1, 2.

Length 13.2 mm., breadth 8.4 mm., height 4.0 mm. (figured specimen collected from Kôchi Pref., Shikohu).

Type locality: Unknown.

Distribution: Honshu, Shikoku and Kyushu.

Macroschisma cuspidata A. Adams ヤジリスカシガヒ

Pl. 17, fig. 26.

1851 *Macrochisma cuspidata* A. Adams, Proc. Zool. Soc. London, p. 202 (1850).

1862 *Macrochisma cuspidata* Sowerby, Thes. Conch., **3**, p. 206, pl. 244, fig. 226.

1890 *Macroschisma cuspidata* Pilsbry, Man. Conch., **12**, p. 193, pl. 59, fig. 60.

Length 13.2 mm., breadth 6.0 mm., height 3.4 mm. (figured specimen collected from Okinawa by A. Teramachi).

Type locality: Cagayan, the Philippines.

Distribution: Philippines; Okinawa and Amami groups.

Genus *Scutus* Montfort 1810 ヲトメガサガヒ屬

1810 *Scutus* Montfort, Syst. Conchyl., **2**, p. 58.

1817 *Parmophorus* Blainville, Bull. Sci. Soc. Phil. Paris, p. 27.

1822 *Parmaphora* Bowdich, Elem. Conch., **1**, p. 24.

1842 *Scutum* Sowerby, Conch. Man., ed. 2, p 254.

Type species: *Scutus antipodes* Montfort (monotypy).

Scutus sinensis (Blainville) ヲトメガサガヒ

Pl. 17, fig. 21.

1825 *Parmophorus sinensis* Blainville, Dict. Sci. Nat., **37**, pp. 155, 362.

1851 *Scutus angustatus* A. Adams, Proc. Zool. Soc. London, p. 222.

1866 *Scutus corrugatus* A. Adams, Thes. Conch., **3**, p. 220, pl. 13, fig. 4; pl. 14, fig. 7.

1870 *Scutus corrugatus* Sowerby, Conch. Icon., sp. 3.

1874 *Scutus corrugatus* Tapparone-Canefri, Zool. Viaggio Intorno al Globo della Regia Fregata Magenta, Malac., p. 70.

1874 *Parmophorus japonicus* Tapparone-Canefri, *l. c.*, pl. 2, fig. 8.

1879 *Scutus unguis* var. c, Smith, Jour. of Conch., **2**, p. 261.

1890 *Scutus unguis* Pilsbry, Man. Conch., **12**, p. 287, pl. 40, figs. 4–8.

1895 *Scutus unguis* Pilsbry, Cat. Mar. Moll. Japan, p. 110.

1916 *Scutus unguis* Thiele, Conch. Cab., **2** (4a), p. 111, pl. 13, fig. 7; pl. 14, fig. 3.

1934 *Scutus scapha* S. Hirase, Coll. Jap. Shells, p. 105, pl. 128 B, fig. 13.

1940 *Scutus sinensis* Iredale, Austr. Zool., **9** (4), p. 430.

1945 *Scutus scapha* Habe, Jap. Jour. Malac. (Venus), **14** (1–4), p. 1, fig. 9.

1947 *Scutus scapha* Hirase et Kuroda, Illust. Encycl. Fauna Japan. (rev. ed.), p. 1194, fig. 3401.

1951 *Scutus sinensis* Is. Taki, Hirase's Handb. Illust. Shells, pl. 128, fig. 13.

Length 38.2 mm., breadth 20.5 mm., height 6.0 mm., with the apex 26.8 mm. from the anterior edge (figured specimen collected from Wakayama Pref. by A. Teramachi).

Type locality: China.

Distribution: China; Kyushu; Shikoku and Honshu.

Scutus emarginatus (Philippi) リウキウヲトメガサガヒ

Pl. 17, figs. 19, 20.

1825 *Parmophorus emarginatus* Philippi, Zeitschr. f. Malak., p. 89.

1879 *Scutus unguis* var. e, Smith, Jour. of Conch., **2**, p. 262.

1928 *Scutus unguis* Yokoyama, Imp. Geol. Surv. Japan, Rep. no. 101, p. 67, pl. 5, fig. 6.

1940 *Scutus emarginatus* Iredale, Austr. Zool., **9** (4), p. 430.

Length 47.8 mm., breadth 22.2 mm., height 6.2 mm., with apex 34.7 mm. from the anterior edge. (examined specimen collected from Okinawa by A.

Teramachi).

Type locality: Liew-Kiew (=Okinawa group).

Distribution: Okinawa and Amami groups.

Remarks: This species is sharply distinguished from the former by its elongate outline and its peculiar type of sculpture, which is composed of rough wrinkles arranged in malleate appearance.

Scutus virgo, new species サヲトメガサ

Pl. 17, fig. 28.

Shell rather small for the genus, not exceeding 22 mm. in the length; patelliform, elongate elliptical in outline, a little elevated, thick and solid, white, covered with thin dull periostracum; anterior margin clearly sinuated at the middle and the posterior margin rounded; both sides parallel; apex situated at the posterior third of the shell length, slightly elevated and turned backwards; anterior slope weekly convex and posterior slope short and rather straight; sculpture consists of regularly concentric growth lines which are distinctly spaced and sometimes bear the malleate appearance; interior of shell white and glossy.

Length 21.4 mm., breadth 11.6 mm., height 4.8 mm. with the apex 15.8 mm. from the anterior edge (figured type specimen).

Length 18.9 mm., breadth 9.8 mm., height 3.6 mm. with the apex 14.8 mm. from the anterior edge (paratype specimen).

Length 18.0 mm., breadth 9.5 mm., height 3.9 mm. with the apex 13.4 mm. from the anterior edge (paratype specimen).

Type locality: Okinawa (collected by A. Teramachi).

Remarks: This new species differs from all other allies in its small size, not exceeding 22 mm. in length and convexly elevated anterior slope.

Genus *Zeidora* A. Adams 1860 フネスソキレガヒ屬

1860 *Zeidora* A. Adams, Ann. Mag. Nat. Hist., (3) **5**, p. 301.
1880 *Crepiemarginula* Seguenza, Atti Roy. Acc. Lincei, Mem. (3) **6**, p. 273.
1883 *Legrandia* Beddome, Proc. Roy. Soc. Tasmania for 1882, p. 169. non Hanley 1871.
1885 *Zidora* Fischer, Man. de Conchyl., p. 861.

Type species: *Zeidora calceolina* A. Adams (monotypy).

Zeidora calceolina A. Adams カウシフネスソキレガヒ

Pl. 17, figs. 33, 34.

1860 *Zeidora calceolina* A. Adams, Ann. Mag. Nat. Hist., (3) **5**, p. 302.
1862 *Zeidora calceolina* A. Adams, *l. c.*, (3) **9**, p. 298.
1866 *Zeidora calceolina* A. Adams et Sowerby, Thes. Conch., **3**, p. 209, fig. 3

1873 *Zeidora calceolina* Sowerby, Conch. Icon., sp. 2.
1886 *Zeidora calceolina* Watson, Chall. Report, **17**, p. 37.
1890 *Zeidora calceolina* Pilsbry, Man. Conch., **12**, p. 247, pl. 64, fig. 27.
1913 *Zeidora calceolina* Thiele, Conch. Cab., **2** (4a), p. 42, pl. 5, fig. 6.
1944 *Zeidora calceolina* Horikoshi, Jap. Jour. Malac., **13** (5–8), p. 257, fig. 2.

Length 6.0 mm., breadth 3.6 mm., height 1.9 mm. (figured specimen collected from Moeshima in the Kagoshima Bay, Kyushu).

Type locality: Straits of Korea, 16 miles from Mino-Sima, (63 fathoms.)

Distribution: Type locality and Moeshima (Pleistocene fossil) (as cited above).

Zeidora reticulata A. Adams フネスソキレガヒ

Pl. 17, fig. 24.

1862 *Zeidora reticulata* A. Adams, Ann. Mag. Nat. Hist., (3) **9**, p. 298.
1866 *Zeidora reticulata* A. Adams et Sowerby, Thes. Conch., **3**, p. 209, figs. 1, 2.
1873 *Zeidora reticulata* Sowerby, Conch. Icon., sp. 1.
1886 *Zeidora reticulata* Watson, Chall. Rep., **17**, p. 37.
1890 *Zeidora reticulata* Pilsbry, Man. Conch., **12**, p. 247, pl. 64, figs. between 16 and 20.
1913 *Zeidora reticulata* Thiele, Conch. Cab., **2** (4a), p. 42, pl. 5, figs. 7–9.
1929 *Zeidora reticulata* Thiele, Handb. syst. Weicht., **1**, p. 32, fig. 17.
1938 *Zeidora reticulata* Wenz, Handb. Palaeozool., **6** (1), p. 175, fig. 275.
1944 *Zeidora reticulata* Horikosi, Jap. Jour. Malac., **13** (5–8), p. 258, fig. 3.

Length 4.8 mm., breadth 2.7 mm., height 1.7 mm. (figured specimen collected from Moeshima by T. Kuroda).

Type locality: Mino-Sima (63 fathoms.)

Distribution: Type locality and Moeshima in the Kagoshima Bay, Kyushu (Pleistocene fossil).

Zeidora limatulaeformis Horikosi ユキバネフネスソキレガヒ

Pl. 17, fig. 22.

1944 *Zeidora limatulaeformis* Horikosi, Jap. Jour. Malac., **13** (5–8), p. 256, fig. 1.

Length 6.0 mm, breadth 3.3 mm., height 1.8 mm. (after Horikosi 1944).

Type locality: Sagami Bay, 4 miles south from Jôga-shima, Miura Peninsula (50 fathoms in depth).

Genus *Rimula* Defrance 1827 マドアキガヒ屬

1827 *Rimula* Defrance, Dict. Sci. Nat., **45**, p. 472.
1834 *Rimularia* Gotthelf Fischer de Waldeheim, Bibliograph. Palaeont., p. 271.

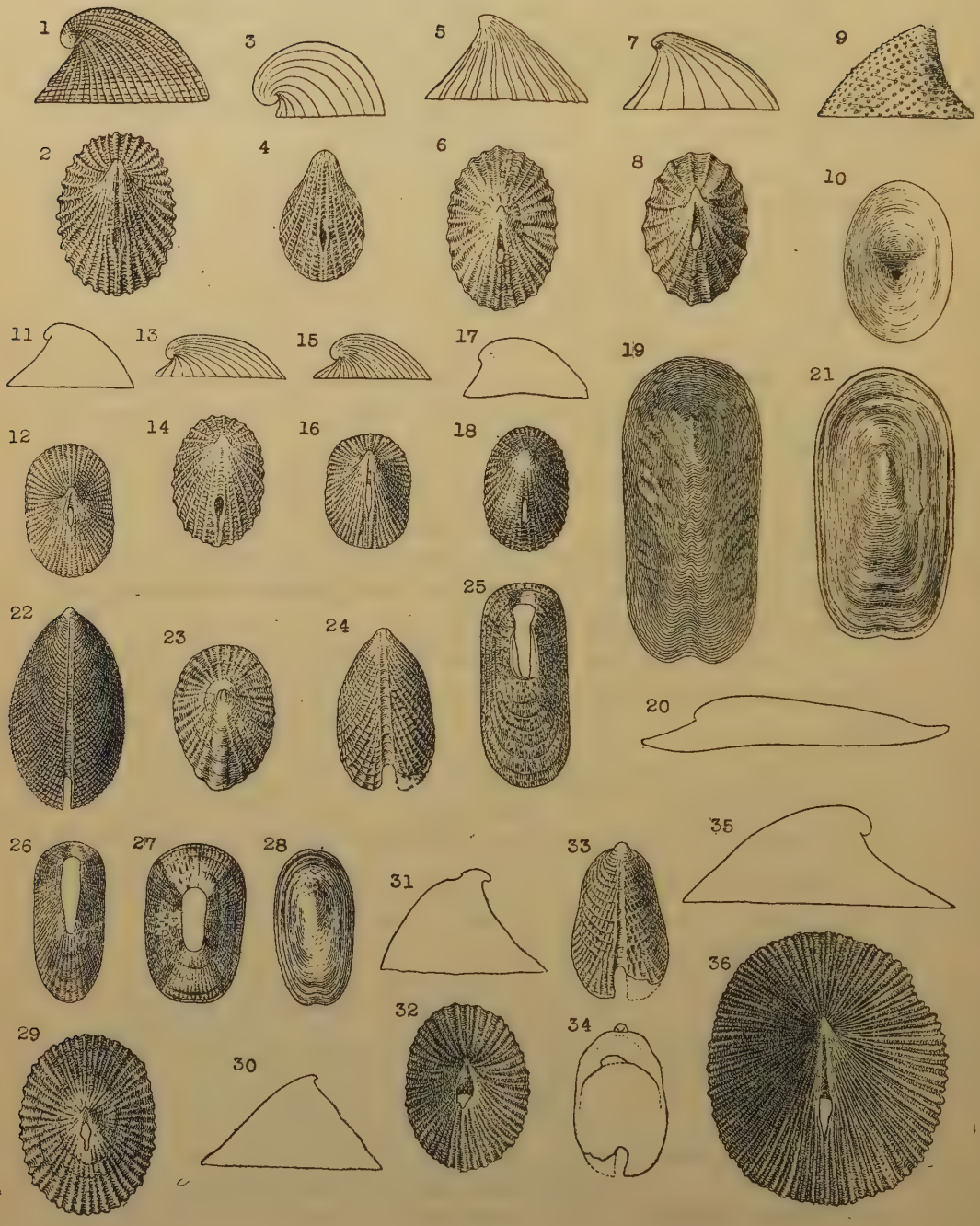
Type species: *Rimula blainvillii* Blainville (designated by Gray 1847).

Rimula exquisita A. Adams マドアキガヒ

Pl. 17, figs. 17, 18.

1853 *Rimula exquisita* A. Adams, Proc. Zool. Soc. London, p. 226 (1851).

Plate 17. Fissurellidae



1863 *Rimula exquisita* A. Adams et Sowerby, Thes. Conch., **3**, p. 210, pl. 10, figs. 3, 4.

1873 *Rimula exquisita* Sowerby, Conch. Icon., sp. 1.

1890 *Emarginula* (*Rimula*) *exquisita* Pisbry, Man. Conch., **12**, p. 270, pl. 64, figs. 3, 4.

1907 *Rimula exquisita* Hedley, Proc. Linn. Soc. N. S. Wales, **32**, p. 478.

1916 *Rimula exquisita* Thiele, Conch. Cab., **2** (4a), p. 138, pl. 15, fig. 19.

Length 10.2 mm., breadth 7.2 mm., height 4.8 mm. (figured specimen collected from Okinawa by A. Teramachi).

Type locality: Catanuan, Luzon and Burias, the Philippines.

Distribution: Philippines, Okinawa and Amami groups; Hachijo Island.

Rimula cumingii A. Adams セムシマドアキガヒ

Pl. 17, figs. 13, 14.

1853 *Rimula cumingii* A. Adams, Proc. Zool. Soc. London, p. 227 (1851).

Explanation of Plate 17. 第17圖版說明

Figs. 1, 2. *Puncturella* (*Cranopsis*) *pelex* (A. Adams) ヤブレガサ, 6.7×4.8×3.5 mm.....p. 118.

3, 4. *Puncturella* (*Cranopsis*) *pileolus* (A. Adams) ヒメカウダカスカシガヒ, 3.6×2.2×2.0 mm.....p. 119.

5, 6. *Puncturella* (*Puncturella*) *nobilis* (A. Adams) カウダカスカシガヒ, 16.8×12.3×9.1 mm.....p. 117.

7, 8. *Puncturella* (*Puncturella*) *sinensis* Sowerby シナカウダカスカシガヒ, 6.0×4.3×3.4 mm.....p. 117.

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13, 14. *Rimula cumingii* A. Adams セムシマドアキガヒ, 3.4×2.5×1.2 mm.....p. 115.

15, 16. *Puncturella* (*Kira*) *teramachii* Kira et Habe テラマチスカシガヒ, 9.5×7.4×4.0 mm.....p. 120.

17, 18. *Rimula exquisita* A. Adams マドアキガヒ, 10.2×7.2×4.8 mm.....p. 115.

19, 20. *Scutus emarginatus* (Philippi) リウキウヲトメガサ, 47.8×22.2×6.2 mm.....p. 111

21. *Scutus sinensis* Blainville ヲトメガサ, 38.2×20.5×6.0 mm.....p. 111.

22. *Zeidora limatulaeformis* Horikosi ユキバネフネスソキレガヒ, 6.0×3.3×1.8 mm. (after Horikosi 1944)....p. 113.

23. *Tugali scutellaris* A. Adams コザルアハビ

24. *Zeidora reticulata* A. Adams フネスソキレガヒ, 4.8×2.7×1.7 mm.....p. 113.

25. *Macroschisma sinensis* A. Adams スカシガヒ, 25.8×11.9×7.1 mm.....p 109.

26. *Macroschisma cuspidata* A. Adams ヤジリスカシガヒ, 13.2×6.0×3.4 mm.....p. 110.

27. *Macroschisma dilatata* A. Adams ヒラスカシガヒ, 13.2×8.4×4.0 mm.....p. 110.

28. *Scutus virgo* n. sp. サヲトメガサ, 18.9×9.5×3.9 mm.....p. 112.

29, 30. *Puncturella* (*Puncturella*) *hirasei* Otuka オホカウダカスカシガヒ, 19.0×14.2×9.7 mm.....p. 117.

31, 32. *Puncturella* (*Puncturella*) *fastigiata* (A. Adams) エンスキスカシガヒ ....p. 118.

33, 34. *Zeidora calceolina* A. Adams カウシフネスソキレガヒ, 6.0×3.6×19. mm.....p. 112.

35, 36. *Puncturella* (*Kira*) *dorcas* Kira et Habe オクガタスカシガヒ, 15.6×14.0×5.5 mm. ....p. 120.

1863 *Rimula cumingii* A. Adams et Sowerby, Thes. Conch., **3**, p. 210, pl. 245, fig. 1.

1873 *Rimula cumingii* Sowerby, Conch. Icon., sp. 2.

1890 *Emarginula* (*Rimula*) *cumingii* Pilsbry, Man. Conch., **12**, p. 271, pl. 63, fig. 9.

1916 *Rimula cumingii* Thiele, Conch. Cab., **2** (4a), p. 141, pl. 16, figs. 1, 1a.

1942 *Rimula cumingii* Yen, Proc. Malac. Soc. London, **24** (5, 6), p. 175, pl. 11, fig. 4.

Length 3.4 mm., breadth 2.5 mm., height 1.2 mm. (figured specimen collected from Imari Bay, Saga Pref., Kyushu).

Type locality: Eastern seas.

Distribution: China; Kyushu; Honshu (Awaji).

Genus *Fissurisepta* Seguenza 1863 フジスカシガヒ屬

1863 *Fissurisepta* Seguenza, Ann. Acc. Asp. Nat., (3) **2**, p. 83.

Type species: *Puncturella* (*Fissurisepta*) *papillosa* Seguenza (designated by Woodring 1928).

Fissurisepta soyoae, new species フジスカシガヒ

Pl. 17, figs. 9, 10.

Shell small, thin, yellowish white, highly conical, somewhat laterally compressed, anterior slope slightly convex, posterior slope concave; apex disappearing; foramen elliptical, placed at the summit, behind the center of the shell, set slightly obliquely; sculpture consists of numerous bluntly prominent minute tubercles, generally arranged in regular curving rows; interior of shell white, glossy; internal septa deeply inserted, extending downwardly as high as the midway of the height, obliquely directed towards the anterior wall, dividing the cavity into two unequal parts, the anterior being smaller.

Length 3.6 mm., breadth 2.4 mm., height 2.3 mm. (figured type specimen).

Type locality: Izu Peninsula (Sôyô-maru Station No. 255[1], 263 m. in depth).

Remarks: This is the first record of the genus *Fissurisepta* known from Japan. *Fissurisepta fumarium* (Hedley) from the from south Pacific Ocean is an another member of this genus, easily separable from the present new species by its more highly conical shell.

Puncturella Lowe 1827 カウダカスカシガヒ屬

1827 *Puncturella* Lowe, Zool. Jour., **3**, p. 77.

1827 *Cemoria* Lowe, Zool. Jour., **3**, p. 77, non Risso 1826.

Type species; *Patella noachina* Linné (monotypy).

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1) All the station numbers cited in this paper are derived from the survey carried out by the S.S. Sôyô-maru of the Japanese Central Fisheries Experimental Station on the continental shelf bordering Japan during 1922–1930.

Subgenus *Puncturella* s. str. カウダカスカシガヒ亞屬

Puncturella (*Puncturella*) *nob lis* (A. Adams) カウダカスカシガヒ

Pl. 17, figs. 5, 6.

1860 *Cemoria nobilis* A. Adams, Ann. Mag. Nat. Hist., (3) **6** (36), p. 422.

1863 *Cemoria nobilis* A. Adams et Sowerby, Thes. Conch., **3**, p. 208, pl. 245, figs. 6–9.

1873 *Cemoria nobilis* Sowerby, Conch. Icon., sp. 6.

1890 *Puncturella nobilis* Pilsbry, Man. Conch., **12**, p. 231, pl. 63, figs. 34–37.

1919 *Puncturella nobilis* Thiele, Conch. Cab., **2** (4a), p. 163, pl. 19, fig. 12.

1922 *Puncturella nobiis* Yokoyama, Jour. Coll. Sci. Imp. Univ. Tokyo, **44** (1), p. 116, pl. 6, figs. 4

1935 *Puncturella nobilis* Otuka, Bull. Earthq. Res. Inst., **13** (4), p. 846, pl. 53, fig. 23a, b, c.

1949 *Puncturella nobilis* Kira et Habe, Jap. Jour. Malac., (Venus), **15** (5–8), p. 85.

1951 *Puncturella nobilis* Is. Taki, Hirase's Handb. Illust. shells, pl. 62, fig. 6.

Length 16.8 mm., breadth 12.3 mm., height 9.1 mm. (figured specimen collected from Iwate Pref., Honshu by A. Teramachi).

Type locality: Okosiri, Hokkaido (35 fathoms).

Distribution: Northern Honshu; Hokkaido; Saghalien; Kurile Islands.

Puncturella (*Puncturella*) *hirasei* Otuka オホカウダカスカシガヒ

Pl. 17, figs. 29, 30.

1934 *Puncturella gigantea* Hirase, Coll. Jap. Shells, pl. 62, fig. 7, non Schepman 1908.

1935 *Puncturella hirasei* Otuka, Bull. Earthq. Res. Inst., **13** (4), p. 847, pl. 53, fig. 22, a–c.

1949 *Puncturella hirasei* Kira et Habe, Jap. Jour. Malac., **15** (5–8), p. 87.

1951 *Puncturella hirasei* Is. Taki, Hirase's Handb. Illust. Shells, pl. 62, fig. 7.

Length 19.0 mm., breadth 14.2 mm., height 9.7 mm. (figured specimen collected from off Sado, Sôyô-maru, Station No. 602).

Type locality: Okino-Se, off Sagami, Honshu.

Distribution: Type locality and off Sado Island (Sôyô-maru Station No. 602, 205 m. in depth); Noto Peninsula (Pleistocene fossil).

Puncturella (*Puncturella*) *sinensis* Sowerby シナカウダカスカシガヒ

Pl. 17, figs. 7, 8.

1894 *Puncturella sinensis* Sowerby, Proc. Malac. Soc. London, **1**, p. 43, pl. 4, fig. 14.

1919 *Puncturella sinensis* Thiele, Conch. Cab., **2** (4a), p. 163, pl. 18, figs. 20, 21.

1942 *Puncturella sinensis* Yen, Proc. Malac. Soc. London, **24**, p. 176, pl. 11, fig. 6.

1949 *Puncturella sinensis* Kira et Habe, Jap. Jour. Malac. (Venus), **15** (5–8), p. 85.

Length 6.0 mm., breadth 4.3 mm. height 3.4 mm. (figured specimen collected from Sôyô-maru Station No. 484, 93 m. in depth).

Type locality: Hongkong.

Distribution: China and Kyushu (off Nagasaki, St. No. 432, 148 m. in depth; off Tsushima, St. No. 468, 112 m. in depth; No. 481, 143 m. in depth).

Puncturella (*Puncturella*) *fastigiata* A. Adams エンスキスカシガヒ

Pl. 17, figs. 31, 32.

1853 *Puncturella fastigiata* A. Adams, Proc. Zool. Soc. London, p. 228 (1851).

1863 *Cemoria fastigiata* A. Adams et Sowerby, Thes. Conch., **3**, p. 208, pl. 10, figs. 15, 16.

1873 *Cemoria fastigiata* Sowerby, Conch. Icon., sp. 4.

1890 *Puncturella fastigiata* Pilsbry, Man. Conch., **12**, p. 230, pl. 63, figs. 31, 32.

1919 *Puncturella fastigiata* Thiele, Conch. Cab., **2** (4a), p. 164, pl. 19, figs. 13, 14.

1920 *Puncturella subconica* Yokoyama, Jour. Coll. Sci. Imp. Univ. Tokyo, **39** (6), p. 87, pl. 6, fig. 7.

1942 *Puncturella fastigiata* Yen, Proc. Malac. Soc. London, **24**, p. 176, pl. 11, fig. 5.

1949 *Puncturella fastigiata* Kira et Habe, Jap. Jour. Malac. (Venus), **15** (5–8), p. 85, textfig. 1.

Length 8.4 mm., breadth 6.3 mm., height 4.7 mm. (examined specimen collected from Tosa by A. Teramachi).

Type locality: Eastern seas.

Distribution: Honshu (Off Shiriya-zaki, Sôyô-maru St. No. 78, 143 m. in depth; No. 658, 113 m.; Off Miyako, St. No. 90, 152 m.; Off Shimoda, St. No. 255, 263 m.; Suruga Bay, St. No. 259, 188 m.; Off Shionomisaki, St. No. 207, 229 m.; Off Tsugaru Peninsula, St. No. 647, 86 m.; No. 646, 123 m.; Off Noto Peninsula, St. No. 572, 132 m.; Off Oki Islands, St. No. 503, 146 m.); Shikoku (Tosa Bay, St. No. 225, 349 m.); Kyushu (Off Gotô Islands St. No. 452, 154 m.; Off Tsushima, St. No. 459, 115 m.; No. 475, 192 m.; Off Iki Island, St. No. 466, 110 m.); China; Kwanto District, Honshu (Pleistocene fossil).

Subgenus *Cranopsis* A. Adams 1860 ヤブレガサ属

1860 *Cranopsis* A. Adams, Ann. Mag. Nat. Hist., (3) **5**, p. 302.

1938 *Craniopsis* Wenz, Handb. Palaeozool., **6** (1), p. 181.

Type species: *Cranopsis pelex* A. Adams (monotypy).

Puncturella (*Cranopsis*) *pelex* (A. Adams) ヤブレガサ

Pl. 17, figs. 1, 2.

1860 *Cranopsis pelex* A. Adams, Ann. Mag. Nat. Hist., (3) **5**, p. 302.

1863 *Cranopsis pelex* A. Adams et Sowerby, Thes. Conch., **3**, p. 209, pl. 245, figs. 3, 4.

1873 *Cranopsis pelex* Sowerby, Conch. Icon., sp. 2.

1890 *Puncturella* (*Cranopsis*) *pelex* Pilsbry, Man. Conch., **12**, p. 241, pl. 28, fig. 8.

1919 *Puncturella* (*Cranopsis*) *pelex* Thiele, Conch. Cab., **2** (4a), p. 145, pl. 16, figs. 8–9.

1949 *Puncturella pelex* Kira et Habe, Jap. Jour. Malac. (Venus), **15** (5–8), p. 86.

Length 6.8 mm., breadth 4.8 mm., height 3.8 mm. (figured specimen collected from Tosa Bay, Shikoku by A. Teramachi).

Type locality: Off Mino-sima, Straits of Korea (63 fathoms).

Distribution: Honshu (Off Inubô-zaki, Sôyô-maru Station No. 12, 325 m. in depth; Sagami Bay, St. No. 240, 192 m.; Suruga Bay, St. No. 259, 188 m.; No. 264, 280 m.; Entrance of Ise Bay, St. No. 384, 21–38 m.; Off Senzaki, St. No. 471, 90 m.; Off Hamada, St. No. 491, 112 m.; Off Oki Islands, St. No. 503, 146 m.; Off Shimane, St. No. 520, 75 m.); Shikoku (Tosa Bay, St. No. 225, 349 m.; Off Ashizuri, St. No. 331, 344 m.); Kyushu (Off Makurazaki, St. No. 417, 192 m.; Off Nagasaki St. No. 432, 148 m.; No. 433, 168 m.; Off Gotô Islands, St. No. 452, 154 m.; Off Tsushima, St. No. 459, 115 m.; No. 168, 112m.; Off Hakata Bay, St. No. 470, 73 m.).

Puncturella (*Cranopsis*) *tosaensis*, new species トサカウダカスカシガヒ

Pl. 17, figs. 11, 12.

Shell white, covered with dull grey periostracum, medium in size, generally attaining 10 mm. in length, rather thin, conical; aperture elliptical; anterior slope convex and posterior slope straight; apical whorls small, one and a half in number, laid to the right of shell without occupying the top of shell, turned backwards and downwards and a little behind the middle of the shell; fasciole lies high on the anterior slope and with transverse lamellae; fissure narrowing both upper and lower ends, and, from the lower end a pair of ribs extend to the margin; sculpture consists of about 45 primary fine radial ribs starting from the end of apical whorls and scondary ribs intercalated between each two of them; intersected by numerous concentric ribs, thus dividing the spaces between the ribs into small square pits; margin thin and finely crenulated; interior of shell snowy white; inter-septum distinct but short, extending downwardly; a groove runs from the lower end of the fissure to the margin, bordered on each side by a shallow callus.

Length 10.6 mm., breadth 7.8 mm., height 5.3 mm (figured type specimen).

Length 9.9 mm., breadth 7.1 mm., height 4.4 mm. (paratype specimen).

Type locality: Tosa Bay, Shikoku (collected by A. Teramachi).

Remarks: This new species is easily distinguished from all other Japanese allies by its fine sculpture.

Puncturella (*Cranopsis*) *pileolus* (A. Adams) ヒメカウダカスカシガヒ

Pl. 17, figs. 3, 4.

1860 *Cranopsis pileolus* A. Adams, Ann. Mag. Nat. Hist., (3) **6**, p. 120.

1863 *Cranopsis pileolus* A. Adams et Sowerby, Thes. Conch., **3**, p. 209, pl. 245, figs. 1, 2.

1873 *Cranopsis pileolus* Sowerby, Conch. Icon., sp. 1.

1890 *Puncturella* (*Cranopsis*) *pileolus* Pilsbry, Man. Conch., **12**, p. 241, pl. 28, fig. 9.

1919 *Puncturella* (*Cranopsis*) *pileolus* Thiele, Conch. Cab., **2** (4a), p. 145, pl. 16, figs. 11, 12.

1949 *Puncturella pileolus* Kira et Habe, Jap. Jour. Malac., **15** (5–8), p. 86.

Length 3.6 mm., breadth 2.2 mm., height 2.0 mm. (figured specimen collected from Tosa Bay by A. Teramachi).

Type locality: Strait of Korea (63 fathoms).

Distribution: Type locality and Shikoku (Off Cape Muroto, St. No. 220, 234 m. in depth); Kyushu (Off Makurazaki, St. No. 417, 192 m. in depth).

Subgenus *Kira* nov.

Shell medium to large in size for the genus *Puncturella*. Numerous distinct radial cords and rather weak growth lines are crossing with each other, but not dividing the interspaces between them into square pits wich are well represented in the subgenus *Cranopsis*. Aperture very wide and surrounded by the flattened part inside of it.

Type species: *Puncturella dorcas* Kira et Habe.

Puncturella (*Kira*) *dorcas* Kira et Habe オクガタスカシガヒ
Pl. 17, figs. 35, 36.

1949 *Puncturella dorcas* Kira et Habe, Jap. Jour. Malac. (Venus), **15** (5–8), p. 87, textfig. 2.

Length 15.6 mm., breadth 14.0 mm., height 5.5 mm. (figured type specimen).

Type locality: Off Tosa, Shikoku (about 100 fathoms).

Distribution: Shikoku and off Yakushima (Sôyô-maru Station No. 414, 514 m. in depth).

Puncturella (*Kira*) *teramachii*, Kira et Habe テラマチスカシガヒ
Pl. 17, figs. 15, 16.

1949 *Puncturella teramachii* Kira et Habe, Jap. Jour. Malac. (Venus), **15** (5–8), p. 88.

Length 9.5 mm., breadth 7.4 mm., height 4.0 mm. (figured type specimen).

Type locality: Off Tosa, Shikoku.

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波 部 忠 重

Pholadomyidae, Clavagellidae, Pandoridae, Juliidae and Condylocardiidae in Japan

by

Tadashige HABE

Family Pholadomyidae ウミタケモドキガヒ科

Genus *Pholadomya* G. B. Sowerby 1823 ウミタケモドキガヒ屬

1823 *Pholadomya* Sowerby, Gen. Recent Fossil Shells, pl. 19, p. 1.

Type species: *Pholadomya candida* Sowerby (monotypy).

Pholadomya pacifica Dall ウミタケモドキガヒ

Pl. 18, figs. 7, 8.

1907 *Pholadomya pacifica* Dall, Smiths. Misc. Coll., **50** (2), p. 172.

1909 *Pholadomya pacifica* Dall, Nautilus, **22**, pp. 115, 142.

1925 *Pholadomya pacifica* Dall, Proc. U. S. Nat. Mus., **66** (17), p. 24, pl. 29, figs. 8, 9.

1940 *Pholadomya japonica* Nomura et Niino, Rec. Oceanogr. Works Japan, **12** (1), p. 61 (may be an error of *Ph. pacifica* Dall), non Yokoyama 1920.

1943 *Pholadomya pacifica* Nagao, Jour. Geol. Soc. Japan, **50** (596), p. 255, pl. 12, figs. 1, 1a.

1952 *Pholadomya pacifica* Habe, Gen. Jap. Shells, **3**, p. 261, fig. 699.

Length 44mm., height 30mm., breadth 25mm. (conjoined valves) (after Dall 1925).

Type locality: Off Hakodate, Hokkaido (44 fathoms in depth).

Distribution: Type locality; off Fukui Pref. and off Oki Islands (Sôyô-maru Station 503, 146 m. in depth) in the Japan Sea; the entrance of Ise Bay (Sôyô-maru St. 384, 38 m. in depth) and off Wakayama Pref., Honshu and Tosa Bay, Shikoku.

SETO MARINE BIOLOGICAL LABORATORY
(Shirahama, Wakayama-ken, Japan)
Contribution No. 172

Family Clavagellidae ハマユフガヒ科

Genus *Clavagella* Lamarck 1818

1818 *Clavagella* Lamarck, Hist. Nat. Anim. s. Vert., **5**, p. 430.

Type species: *Clavagella echinata* Lamarck (by Children 1822).

Subgenus *Stirpulina* Stoliczka 1870 ハマユフガヒ亞屬

1870 *Stirpulina* Stoliczka, Cret. Fauna Southern India, **3**, p. 28.

Type species: *Clavagella bacillaris* Deshayes (by Habe 1952).

Clavagella (*Stirpulina*) *ramosa* Dunker ハマユフガヒ

Pl. 18, fig. 19.

1882 *Clavagella ramosa* Dunker, Index Moll. Mar. Japon., p. 172, pl. 16, figs. 1, 2.

1934 *Clavagella* (*Stirpulina*) *ramosa* S. Hirase, Coll. Jap. Shells, p. 12, pl. 20, fig. 4.

1947 *Clavagella* (*Stirpulina*) *ramosa* Kuroda, Illust. Encycl. Fauna Japan, p. 1203, fig. 3416.

1951 *Clavagella ramosa* Is. Taki, Handb. Illust. Shells, pl. 20, fig. 4.

1952 *Clavagella* (*Stirpulina*) *ramosa* Habe, Gen. Jap. Shells, **3**, p. 268, gg. 712.

Length of tube 75 mm., diam. of tube 11 mm. (figured specimen collected from Sagami Bay by Mr. Kawamura).

Type locality: Wakayama, Honshu.

Distribution: Wakayama Pref.; Sagami Bay and Bôsô Peninsula, and Toyama Bay, Honshu.

Genus *Penicillus* Bruguière 1789

1770 *Brechites* Guettard, Mem. diff. Sci., **3**, p. 154 (n. n.).

1789 *Penicillus* Bruguière, Encycl. Meth. (Vers), **1**, p. 126.

1798 *Verpa* Röding, Mus. Bolten., p. 69.

1818 *Aspergillum* Lamarck, Anim. s. Vert. Hist. Nat., **5**, p. 429.

Type species: *Penicillus javanus* Bruguière (by Gray 1847)

Subgenus *Warnea* Gray 1858 ツツガキ屬

1858 *Warnea* Gray, Proc. Zool. Soc. London, p. 309.

Type species: *Aspergillum vaginiferum* Lamarck.

Penicillus (*Warnea*) *giganteus* (Sowerby) ツツガキ

Pl. 18, fig. 10.

1888 *Aspergillum giganteum* Sowerby, Proc. Zool. Soc. London, p. 290.

1895 *Aspergillum giganteum* Pilsbry, Cat. Mar. Moll. Japan, p. 136, pl. 3, fig. 1.

1926 *Aspergillum giganteum* Yokoyama, Jour. Fac. Sci. Imp. Univ. Tokyo, (2) **1** (9), p. 368, pl. 42, figs. 1, 2.

1933 *Brechites giganteus* Nomura, Sci. Rep. Tohoku Imp. Univ., (2) **16** (1), p. 65.

1947 *Brechites* (*Warnea*) *giganteus* Kuroda, Illust. Encycl. Fauna Japan, p. 1204, fig. 3417.

1952 *Penicillus* (*Warnea*) *giganteus* Habe, Gen. Jap. Shalls, **3**, p. 268, fig. 713.

Length of tube 200 mm., diam. of tube 37 mm. (figured specimen collected from Bôsô Peninsula, Honshu).

Type locality: Japan.

Distribution: Honshu; Shikoku and Kyûshû; Formosa (Pliocene).

Remarks: *Clavagella japonica* Yokoyama 1926 (Jour. Fac. Sci. Imp. Univ. Tokyo, (2) **1** (9), p. 386, pl. 44, figs. 11, 12) from Anden, Akita Pref., Honshu may be a tube of an Annelid.

Family Pandoridae ネリガヒ科

Genus *Pandora* Chemnitz 1795

1795 *Pandora* Chemnitz, Neues Syst. Conch. Cab., **11**, p. 211.

1798 *Calopodium* Röding, Mus. Bolten., p. 166.

Type species: *Pandora inaequivalvis* Chemnitz (=*Solen inaequivalvis* Linné) (by Winckworth 1945).

Subgenus *Kennerlia* Carpenter 1864 ネリガヒ亞屬

1864 *Kennerlia* Carpenter, Proc. Zool. Soc. London, p. 602.

1887 *Kennerleya* Fischer, Man. Conchyl., p. 1158.

1903 *Kennerleyia* Dall, Trans. Wagner Free Inst. Sci. **3**, p. 1517.

Type species: *Kennerlia filosa* Carpenter (by Dall 1903)

1. *Pandora* (*Kennerlia*) *wardiana* A. Adams ヒラネリガヒ

Pl. 18, figs. 1, 2, 3.

1859 *Pandora wardiana* A. Adams, Proc. Zool. Soc. London, p. 487.

1864 *Pandora wardiana* Carpenter, *l. c.*, p. 602.

1929 *Pandora* (*Kennerleyia*) cf. *wardiana* Fujita, Venus, **1** (2), p. 61, pl. 3, fig. 2.

1940 *Pandora* (*Kennerleyia*) *japanensis* Nomura et Hatai, (in part), Saito Ho-on Kai Mus., Res. Bull. **19**, p. 86, pl. 4, figs. 13a-d, only (not figs. 14a, b).

1952 *Pandora* (*Kennerlia*) *wardiana* Habe, Gen. Jap. Shell, **3**, p. 259, figs. 686, 687. 688.

Length 51.6 mm., height 32.5 mm., breadth 9.7 mm. (conjoined valves) (figured specimen collected from Fukui Pref., Honshu).

Type locality: Sunday Island, Coast of Manchuria (20 fathoms in depth).

Distribution: Funka-Wan (Volcano Bay), Hokkaido (65m. in depth); Kyurokujima, Aomori Pref.; Tateyama Bay, Chiba Pref.; off Noto Peninsula; Wakasa Bay, Fukui Pref. and off Shimane Pref., (Sôyô-maru St. 493, 146 m. in depth), Honshu; and Oki Islands in Japan Sea (Sôyô-maru St. 503, 146 m. in depth).

Remarks: *Pandora grandis* Dall[1] (=*Pandora wardiana* Sowerby 1874[2], non

1) Prelim. Descript. Moll. N.-W. Coast America, p. 5 (1877).

2) Conch. Icon., sp. 3.

A. Adams 1859) from California is a quite different species from this Japanese form in having more round outline.

2. *Pandora* (*Kennerlia*) *pseudobilirata* Nomura et Hatai ウスネリガヒ

Pl. 18, fig. 9.

1874 *Pandora delicatula* Sowerby, Conch. Icon., sp. 17, non Carpenter 1864.[3]

1940 *Pandora* (*Kennerleyia*) *pseudobilirata* Nomura et Hatai, Saito Ho-on Kai Mus., Res. Bull. **19**, p. 87, pl. 4, figs. 15a, b.

1940 *Pandora* (*Kennerleyia*) *japanensis* Nomura et Hatai (in part), *l. c.*, pl. 4, figs. 14a, b.

Length 19.8 mm., height 12.0 mm., breadth 4.2 mm. (figured specimen collected from the Sagami Bay, Honshu by Kawamura).

Type locality: Kyuroku-jima, Aomori Pref., Honshu.

Distribution: Off Cape Shiriya, Aomori Pref. (Sôyô-maru St. 658, 113m. in depth); Sagami Bay; Suruga Bay (St. 259, 188 m. and St. 286, 123 m.); Tanabe Bay, Wakayama Pref.; off Tsugaru Peninsula, Aomori Pref. (St. 646, 123 m.); Kyuroku-jima, Aomori Pref.; Sado Island (St. 599, 181 m.); Noto Peninsula (about 100 fathoms); Wakasa Bay, Fukui Pref.; Oki Islands (St. 503, 146 m.) in Japan Sea; Chosen Strait (St. 488, 406 m.) and Tsushima Strait (St. 468, 112 m.); Tosa Bay (St. 220, 234 m.), Shikoku; Bungo Channel (St. 322, 110 m.); Hyuga Nada (St. 309, 472 m.) and off Goto Islands, Kyushu.

3. *Pandora* (*Kennerlia*) *otukai* n. sp. ネリガヒ

Pl. 18, figs. 11, 12.

1934 *Pandora* (*Kennerleyia*) *bicarinata?* S. Hirase, Coll. Jap. Shells, pl. 20, fig 2, non Carpenter 1864.[4]

1936 *Pandora* (*Kennerlia*) *bicarinata* var. Otuka, Jour. Geol. Soc. Japan, **48**, p. 732, pl. 41, figs. 7a, b.

1951 *Pandora radiata?* Is. Taki, Handb. Illust. Shells, pl. 20, fig. 2, non "Hanley 1842" Sowerby 1835).[5]

1952 *Pandora* (*Kennerlia*) *otukai* Habe, Gen. Jap. Shells, 3, p. 259, figs. 689, 690 (name and figures only)

Shell medium in size for the genus, inequivalve, the left valve embraces the right, thin, white beneath the pale brown periostracum, inequilateral, anterior dorsal margin shorter than the posterior; anterior end bluntly pointed; the posterior shortly produced at the end and the ventral margin arcuate;

3) Proc. Zool. Soc. London, p. 600.
4) Proc. Zool. Soc. London, p. 603.
5) Proc. Zool. Soc. London, p. 94.

left valve planoconvex; a submarginal ridge runs from the umbo to the posterior end and a flexuous groove from the umbo to the ventral margin; thus the surface is divided into three unequal areas, the anterior area small and triangular, the middle the broadest and the posterior long and narrow; the right valve flat, marked by fine growth lines and radial grooves with unequal intervals; Interior of both valves pearly; hinge of the left valve with two thickened teeth and an additional small one between them; lithodesma placed under the posterior cardinal tooth; right valve with two diverging cardinal teeth.

Length 19.9 mm. height 12.8 mm., breadth 4.6 mm. (figured type specimen collected from Sagami Bay by Mr. Kawamura).

Type locality: Sagami Bay, Honshu (about 50 fathoms in depth).

Distribution: Type locality and Bôsô Peninsula (Sôyô-maru St. 4, 287 m. in depth).

Remarks: There are two species resembling this new species, viz. *Pandora radiata* Sowerby from Colombia, South America and *Pandora bicarinata* Carpenter from California; both of them are more elongate than this in outline.

4. *Pandora* (*Kennerlia*) *nipponica* new species ニッポンネリガヒ

Pl. 18, fig. 6.

Shell small, thin, triangular in shape, pearly, inequivalves, left valve larger than the right, inequilateral, bluntly pointed at the anterior end and truncated at the posterior; left valve convex with a prominent beak; surface rather smooth; a keel runs from the umbo to the postero-ventral corner and a flexuous groove from the umbo to the ventral margin, dividing a small triangular anterior area from the larger middle and posterior areas; right valve small, flat, marking fine growth lines and distant radiating grooves.

Length 12.7 mm., height 9.3 mm., breadth 3.3 mm. (figured type specimen).

Type locality: Tosa Bay, Shikoku (about 120 fathoms in depth).

Distribution: Kii Channel (Sôyô-maru St. 392, 61 m. in depth); Tosa Bay; and off Gotô Islands, Kyûshû (St. 432, 148 m. in depth).

Remarks: This new species closely resembles *Pandora carinata* Prashad[6], but may be distinguished from that in lucking the undulated growth lines on the surface of the left valve.

Genus *Heteroclidus* Dall 1903

1903 *Heteroclidus* Dall, Trans. Wagner Free Inst. Sci., 3, p. 1518.

Type species: *Clidiophora punctata* Conrad (original designation)

6) Siboga Exped., Monogr. 53c, p. 323, pl. 7, figs. 15—18.

5. *Heteroclidus* (?) *pulchellus* (Yokoyama)

Pl. 18, figs. 13, 14, 15.

1926 *Pandora pulchella* Yokoyama, Jour. Fac. Sci. Imp. Univ. Tokyo, (2) **1** (9), p. 387, pl. 45, fig. 4.

1931 *Pandora pulchella* Kuroda, in Homma's Shinano Chubu Chishitsushi, **4** (1), p. 44, pl. 4, fig. 19.

1933 *Calopodium pulchellum* Onoyama, Chikyu, **19** (4), p. 266.

1936 *Pandora* (*Kennerlia*) *pulchella* Otuka, Jour. Geol. Soc. Japan, **43**, p. 732, pl. 41, fig. 8.

1943 *Pandora* (*Heteroclidus*) *pulchella* Otuka, Jour. Geol. Soc. Japan, **50** (592), p. 25, pl. 2, figs. 1—4.

Length 33.8 mm., height 22.0 mm. breadth 5.6mm. (figured specimen collected from Tayazawa, Minami-Akita-gun, Akita Pref., Honshu by Katura Oyama).

Type locality: Anden, Akita Pref., Northern Honshu (Pliocene fossil).

Fossil localities: Akita; Niigata, Fukushima and Nagano Prefectures, Honshu.

Distribution: Off Tottori Pref. (Sôyô-maru Station No. 523, 181m. in depth); off Noto Peninsula (St. No. 572, 132 m. in depth) in the Japan Sea.

Remarks: *Pandora* (*Heteroclidus*) *hukusimana* Otuka is an allied fossil species.

Family Juliidae ユリヤガヒ科

Genus *Julia* Gould 1862

1862 *Julia* Gould, Proc. Boston Soc. Nat. Hist., **8**, p. 283.

Type species: *Julia exquisita* Gould (monotypy)

Subgenus *Prasina* Deshayes 1863 ユリヤガヒ亞屬

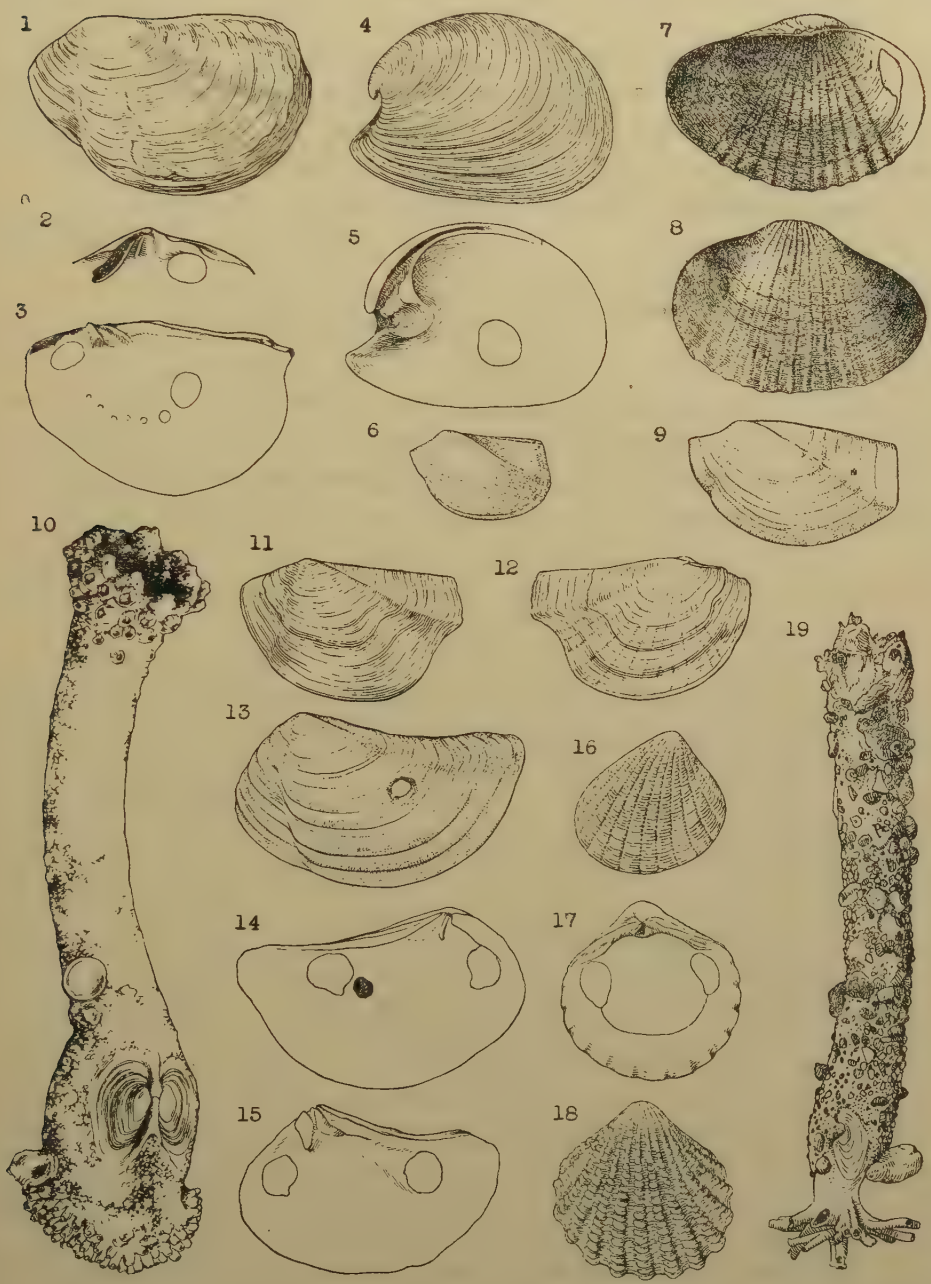
1863 *Prasina* Deshayes, Cat. Moll. Reunion, p. 29.

Type species: *Prasina borbonica* Deshayes (monotypy)

Explanation of Plate 18. 第18圖版說明

Figs. 1, 2, 3. *Pandora* (*Kennerlia*) *wardiana* A. Adams ヒラネリガヒ, 51.6×32.6 mm. p. 123
4, 5. *Julia* (*Prasina*) *japonica* Kuroda et Habe ユリヤガヒ, 5.9×4.5 mm. p. 128
6. *Pandora* (*Kennerlia*) *nipponica* n. sp. ニツポンネリガヒ, 1.2.7×9.3 mm. p. 125
7, 8. *Pholadomya pacifica* Dall ウミタケモドキ, 44.0×30.0 mm (after Dall). p. 121
9. *Pandora* (*Kennerlia*) *pseudobilirata* Nomura et Hatai ウスネリガヒ, 19.8×12.0 mm. p. 124
10. *Penicillus* (*Warnea*) *giganteus* (Sowerby) ツツガキ, 200×37 mm. p. 122
11, 12. *Pandora* (*Kennerlia*) *otukai* n. sp. ネリガヒ, 19.9×12.8 mm. p. 124
13, 14, 15. *Heteroclidus pulchellus* (Yokoyama), 33.8×22.0 mm.. p. 126
16. *Carditellopsis toneana* (Yokoyama) ケシフミガヒ, 2.5×2.5 mm. p. 128
17, 18. *Carditellona hanzawai* (Nomura) ケシザルガヒ, 2.7×2.5 mm. p. 128
19. *Clavagella* (*Stirpulina*) *ramosa* Dunker ハマユフ, 75×11 mm. p. 122

Plate 18. Habe: Pholadomyidae, Clavagellidae, Pandoridae, Juliidae and Condylocardiidae.



Julia (*Prasina*) *japonica* Kuroda et Habe ユリヤガヒ

Pl. 18, figs. 4, 5.

1935 *Julia exquisita* Kuroda, Venus, **5** (4), App. p. 145, textfigs. 146, 147, non Gould 1862.

1951 *Julia* (*Prasina*) *japonica* Kuroda et Habe, Illust. Cat. Jap. Shells, No. 11, p. 86.

1951 *Julia* (*Parasina*) (sic) *japonica* Habe, Genera Jap. Shells, **2**, p. 122, figs. 252, 253.

Length 5.9 mm., height 4.5 mm., breadth 3.4 mm. (conjoined valves) (figured specimen collected from Kakeroma-jima, Amami group by Mr. Kawamura).

Type locality: Nada, Wakayama Pref., Honshu.

Distribution: Amami group; Wakayama Pref., Bôsô Peninsula, Hoshu and Izu-Shichito.

Remarks: This is a uniformly green smooth species.

Family Condylocardiidae ケシフミガヒ科

Genus Carditellona Iredale 1936 ケシザルガヒ属

1936 *Carditellona* Iredale, Rec. Austr. Mus., **19** (5), p. 272.

Type species: *Carditella angasi* Smith (original designation)

Carditellona hanzawai (Nomura) ケシザルガヒ

Pl. 18, figs. 17, 18.

1933 *Cardium* (*Cerastoderma*) *hanzawai* Nomura, Sci. Rep. Tohoku Imp. Univ., (2) **16** (1), p. 79, pl. 3, figs. 18a, b; 19a, b.

1951 *Carditella hanzawai* Habe, Genera Jap. Shells, No. 2, p. 110, figs. 221, 222.

Length 2.7 mm., height 2.5 mm. breadth 1.0 mm. (left valve) (figured specimen collected from the Obama Bay, Fukui Pref., Honshu).

Type locality: Hakushaton, Koryu-sho, Chikunan-gun, Shinchiku-shu, Formosa (=Taiwan) (Pliocene)

Distribution: The Japan Sea coast of Honshu and Kyushu (Recent) and Formosa (Pliocene)

Genus *Carditellopsis* Iredale 1936 フシフミガヒ属

1936 *Carditellopsis* Iredale, Rec. Austr. Mus., **19** (5), p. 272.

Type species: *Carditella elegantula* Tate et May (original designation)

Carditellopsis toneana (Yokoyama) ケシフミガヒ

Pl. 18, fig. 16.

1922 *Venericardia toneana* Yokoyama, Jour. Coll. Sci. Imp. Univ. Tokyo, **44** (1), p. 163, pl. 13, figs. 7, 8.

1933 *Cardium* (? *Cerastoderma*) *toneana* Nomura, Sci. Rep. Tohoku Imp. Univ., (2) **16** (1), p. 80.

1935 "*Cardium*" *toneana* Nomura et Hatai, Saito Ho-on Kai Mus., Res. Bull. No. 5, p. 11.

1951 *Carditella toneana* Habe, Genera Jap. Shells, No. 2, p. 110, fig. 220.

Length 2.5 mm., height 2.5 mm., breadth 0.8 mm. (right valve) (Hirota mura, Kesen-gun, Iwate Pref., Honshu).

Type locality: Shito, Ichikawa-gun, Chiba Pref., Honshu (Pleistocene).

Distribution: Kyushu and Honshu (Recent); Kwanto District, Honshu (Pleistocene) and Formosa (Pliocene).

Illustrations of the Japanese species which were not figured hitherto are given herewith.

1. *Calliotropis hondoensis* (Dall)

Textfigs. 15, 16.

1919 *Solariel'a* (*Solaricida*) *hondoensis* Dall, Proc. U. S. Nat. Mus., **56** (2265), p. 361.

Height 16.3 mm., breadth 15.4 mm. (young specimen) (figured paratype specimen is deposited in the Zoological Institute of Kyoto University received from the U. S. National Museum).

Type locality: Off Shionomisaki, Wakayama Pref., Honshu (U. S. Bureau of Fisheries Station 4974; 905 fathoms in depth).

2. *Adamsenida* (n. gen.) *gemmulosa* (A. Adams)

Textfigs. 9, 10.

1860 *Enida gemmulosa* A. Adams, Ann. Mag. Nat. Hist., (3) **5** (28), p. 409.

1929 *Enida gemmulosa* Makiyama, Venus, **1** (5), p. 168.

Height 6.5 mm., breadth 4.8 mm. (figured specimen collected from the Tosa Bay, Shikoku: Sôyô-maru station 221, 209 m. in depth).

Type locality: Off Mino-Sima (=Mishima) in the Japan Sea (63 fathoms in depth).

Remarks: *Solariellopsis* Schepman 1908 to which *Enida gemmulosa* belongs, was preoccupied by Gregorio 1886, so that a new term is here given. The radular formula of this genus is a *Turcicula*-series which is decidedly different from that of *Enida* A. Adams 1860 (the type species being *E. japonica* and here figured: textfigs 4, 5). The shape of the columellar pillar is also very different from the species of *Calliotropis* Seguenza 1903, though the general outline of shell resembles closely. The genotype of the new *Adamsenida* is *Enida gemmulosa*, the figures of which are here given.

3. *Microstelma daedala* A. Adams

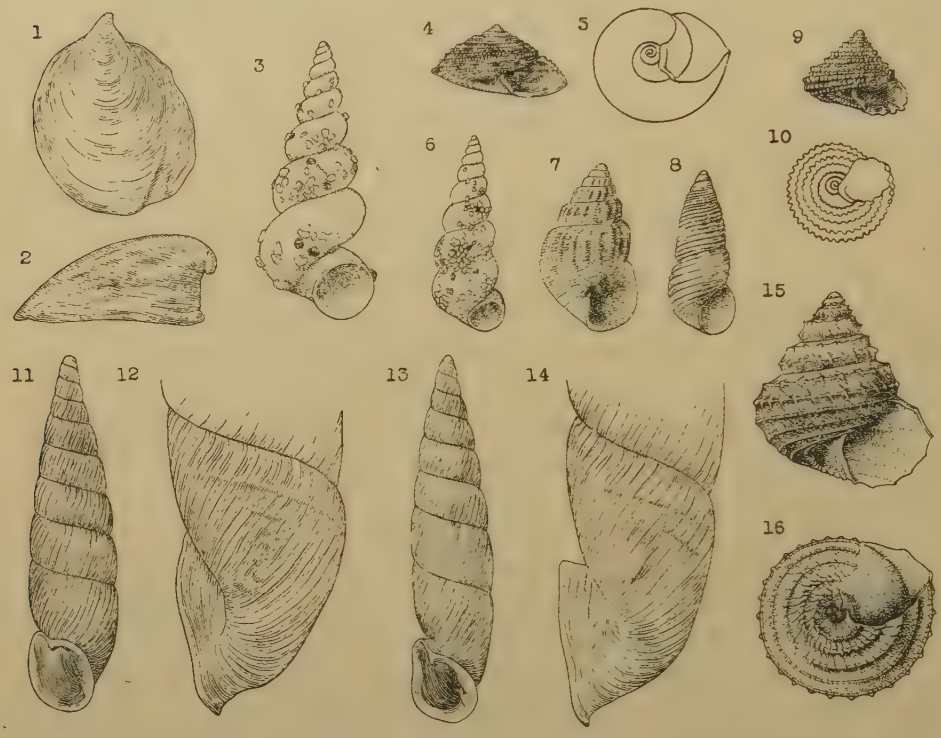
Textfig. 7.

1863 *Microstelma daedala* A. Adams, Ann. Mag. Nat. Hist., (3) **11** (65), p. 348.

1929 *Microstelma daedala* Makiyama, Venus, **1** (5), p. 168.

Height 5.4 mm., breadth 3.0 mm. (figured specimen collected from the Gotô Islands, Nagasaki Pref., Kyûshû; Sôyô-maru station 452, 154 m. in depth).

Type locality: Gotto (=Gotô) Islands (48 fathoms in depth).



Textfigs. 1, 2. *Malluvium otohimeae* (Habe) ヲトヒメスズメ, 3. *Scaʾiola bella* A. Adams スナモチツボ, 3.7×1.5 mm., 4, 5. *Enida japonica* A. Adams ハグルマシタダミ, 8.8×5.3 mm., 6. *Scaliola glareosa* A. Adams, 7. *Microstelma daedala* A. Adams, 8. *Diala sulcifera* A. Adams, 9, 10. *Adamsenida gemmulosa* (A. Adams), 11, 12. *Euphaedusa aculus* (Benson) チユウシコキセル, 13, 14. *Euphaedusa kurodai* (Habe) クロダコキセル, 15, 16. *Calliotropis hondoensis* (Dall).

4. *Diala sulcifera* A. Adams

Textfig. 8.

1862 *Diala sulcifera* A. Adams, Ann. Mag. Nat. Hist., (3) **10** (58), p. 298.

1929 *Diala sulcifera* Makiyama, Venus, **1** (5), p. 170.

Height 3.2mm., breadth 1.3mm. (figured specimen collected from the Tanabe Bay, Wakayama Pref., Honshu).

Type localities: Osima (=Oshima) and Tanabe, Wakayama Pref., Honshu.

5. *Scaliola glareosa* A. Adams

Textfig. 6.

1862 *Scaliola glareosa* A. Adams, Ann. Mag. Nat. Hist., (3) **10** (60), p. 421.

1929 *Scaliola glareosa* Makiyama, Venus, **1** (5), p. 168.

Height 2.8mm., breadth 1.0mm. (figured specimen collected from the Obama Bay, Fukui Pref., Honshu).

Type localities: Tsusima (=Tsushima) between Kyushu and Korea and Takano Sima (=Takanoshima) in the Tateyama Bay, Chiba Pref., Honshu.

Remarks: Though *Scaliola bella* A. Adams, the type species of this genus was figured by himself in the Journal de Conchyliologie, Tome 16, his original description shows clearly an another representative, the shell of which is larger and wider and the body whorl is disjointed, not uncommon in our seas. Therefore I am giving a new figure (textfig. 3) of the shell that is more consistent with Adams's description. The shell figured by him under that name in the French journal seems some another species. The small and narrow species with contiguous whorl and a different nature of agglutination of sands here figured (textfig. 6) for comparison may be called by the name of his *Scaliola glareosa* which is also frequent to our eyes.

6. *Malluvium otohimeae* (Habe) ヲトヒメスズメ

Textfigs. 1, 2.

1936 *Amalthea lissa* Peile, Proc. Malac. Soc. London, **21**, p. 251 (not of Smith 1894).

1946 *Amalthea* (*Malluvium*) *otohimeae* Habe, Jap. Jour. Malac. (Venus), **14** (5—8), p. 197, fig. 10 (radula).

Length 7.5 mm., height 3.9 mm., breadth 7.2 mm. (figured type specimen).

Type locality: Off Minabe, Wakayama Pref., Honshu.

Remarks: This species is generally attached on the surface of such gastropods as siphonalid and muricid species.

7. *Euphaedusa kurodai* (Habe) クロダコギセル

Textfigs. 13, 14.

1905 *Clausilia* (*Euphaedusa*) *aculus* Pilsbry, Proc. Acad. Nat. Sci. Phila., **57**, p. 738 (not of Benson 1842).

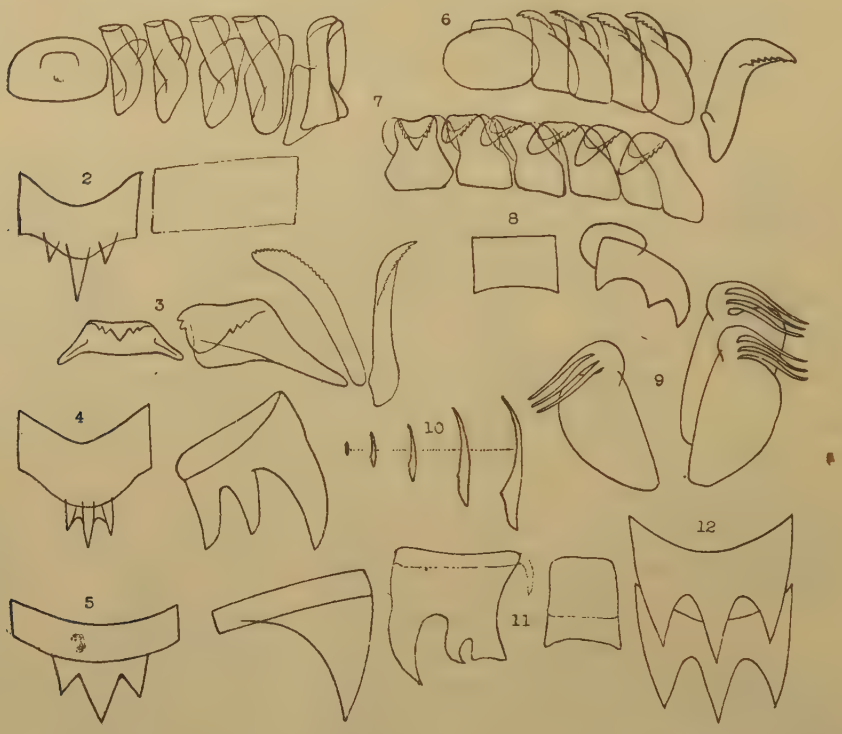
1943 *Phaedusa* (*Euphaedusa*) *kurodai* Habe, Jap. Jour. Malac. (Venus), **13** (1—4), p. 84, textfig. 1 (genital organ).

Height 16.1 mm., breadth 3.1 mm. (figured type specimen).

Type locality: Taikei, Giran-gun, Taihoku-shu, Formosa.

Remarks: In comparison for this species, a specimen of *Euphaedusa aculus* (Benson) from Hangchow, Che-kiang, China, is here figured which measures 14.0 mm. in height and 3.4 mm. in breath (textfigs. 11, 12).

In the following space of pages, I give some important radulae of the Japanese Gastropods.



Radulae 歯舌: 1. Central and lateral teeth of *Guildfordia triumphans* (Philippi) リンボウガヒ (和歌山縣); 2. *Harpa conoidalis* Lamarck シヨクコウラ (高知縣); 3. *Pseudoliotia micans* (A. Adams) ヒメシラギク (和歌山縣); 4. *Siphonofusus lubrica* (Dall) ヲナガミクリ (高知縣); 5. *Benthovoluta hilgendorfi* (v. Martens) ツノキフデ (高知縣); 6. Central and lateral teeth of *Enida japonica* (A. Adams) ハグルマシタダミ (高知縣); 7. Central and lateral teeth of *Eotricolia megastoma* (Plisbry) ベニバイ (伊豆半島); 8. *Clathranachis japonica* (A. Adams) カゴメヌカボラ (和歌山縣); 9. *Discotectonica acutissima* (Sowerby) ウスバグルマ (高知縣); 10. *Epitonium scalare* (Linné) オホイトカケ (和歌山縣); 11. *Japelion adelphicus* (Dall) ツムガタネヂボラ (高知縣); 12. *Teramachia tibiaeformis* Kuroda テラマチボラ (高知縣).

正誤: 圖錄 No. 15, キサガヒモドキ (科, 屬も) はキサガヒの誤.

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Address: Nanki Biological Society,
c/o Seto Marine Biological Laboratory
Sirahama, Wakayama-ken,
Japan.

紀州産後鰓類目錄[1)]

List of the Species of the Opisthobranchia from Kii, Middle-Japan

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（昭和26年9月15日受領）

馬場は1938年に當時までに紀州産として知られている後鰓類の目錄を編成し，かつ新属新種等の記載を行つたが，爾後瀬戸臨海實驗所を中心とする研究活動が進捗するにつれ，なお多くのこの類の採集品が集積するに至つた．これらの採集品は同所内海富士夫博士・時岡　隆博士・山路　勇氏並びに山本虎夫氏等によつて，主として實驗所の近傍から獲られたものである．また江奈中學校後藤　宏氏による由良附近の後鰓類についても採集がなされた．一方筆者等も近畿地區に居住する關係から最近屢々瀬戸臨海實驗所を訪れて後鰓類を實地に調査研究する機會に惠まれた．いま内海博士並びに山本虎夫氏の熱心なおすすめに從つて，現在までの諸採集品に基く紀州産後鰓類目錄の再編成をして，同好各位の參考に供することとした．もし馬場（1938）の目錄を第一次發表とするならば，今回の分は中間的なもので，今後更に研究を續行して出來うる限りのこの方面に對するまとまつた寄與をなしたいと思う．本目錄のなかには新しく採集した新種等の學名は示されていない．それらについては研究の完了するに從つて後日發表するつもりである．

本目錄作成に當り，筆者等はまず瀬戸臨海實驗所の施設の利用を許可された同所長宮地傳三郎博士に謝意を表さなければならない．また前出の内海・時岡・山路・山本等の臨海實驗所所員諸氏並びに篤志家後藤氏の絕えざる御援助に對しては，適當な感謝の言葉を見出しえない次第である．

筆者等は紀州産後鰓類の種名を明らかにすると同時に，できうる限り彼等の生時における生理や生態（食性・產卵の習性及び運動法等）に關する事柄をも研究すべく企圖している．この方面についても同好各位の御援助をうることができたら幸甚である．

1）本研究の費用の一部は文部省自然科學研究費の援助によるものである．

Phylum Mollusca 軟体動物門

Class Gastropoda 腹足綱

Subclass Opisthobranchia 後鰓亞綱

I. Order Cephalaspidea 頭楯目

Suborder *Philinacea* キセワタ亞目

Family Aglaiidae カノコキセワタ科

1. *Aglaia gigliolii* TAPPARONE-CANEFRI カノコキセワタ

瀧 (1936), ヴイナスVI (1): 48; 馬場 (1937), 九大農紀 V(4): 204.

採集地：和歌浦・瀬戸.

2. *A. cyanea* (MARTENS) カラスキセワタ

馬場 (1937), 九大農紀 V (4): 245; 動図: 1085.

採集地：瀬戸.

3. *Chelidonura hirundinina* (QUOY & GAIMARD) ニシキツバメガイ

瀧 (1930), ヴイナス II (2): 57; 相模図譜: 22; 動図: 1084.

印度洋から濠洲・小笠原等に産し，熱帯海域の特色ある小形の種．岩礁のタイドプールにいる．

採集地：瀬戸.

4. *C. fulvipunctata* BABA アカボシツバメガイ

馬場 (1938), 九大農紀 VI (1): 3.

採集地：瀬戸.

Suborder *Peltacea* ルンキナウミウシ亞目

Family Runcinidae ルンキナウミウシ科

5. *Runcina* sp.

天草産 ルンキナウミウシ(新稱) *R. elioti* BABA〔馬場(1937), 九大農紀V(4): 202〕に似ているが，未査定.

採集地：瀬戸.

II. Order Anaspidea 無楯目 (=Aplysiacea アメフラシ目)

Family Aplysiidae (=Tethyidae) アメフラシ科

6. *Aplysia dactylomela* RANG ジヤノメアメフラシ

瀧 (1932), ヴイナスIII (4): 212; 馬場 (1936), 九大農紀V (1): 7; 相模図譜: 23.

世界の囲赤道海域に分布する代表的な種.

採集地：瀬戸.

7. *A. parvula* MÖRCH クロヘリアメフラシ

馬場 (1937), 九大農紀V(4): 208; 相模図譜: 24; 動図: 1084.

採集地：潮岬・瀬戸・加太.

8. *A. sibogae* BERGH アマクサアメフラシ

馬場 (1937), 九大農紀 V(4): 211; 相模図譜: 24; 動図: 1083.

採集地：瀬戸.

9. *A. hirasei* (BABA) ミドリアメフラシ

馬場 (1936), 九大農紀V(1): 10; 相模図譜: 25; 動図: 1084.

採集地：瀬戸.

10. *A. kurodai* (BABA) アメフラシ

馬場（1937），九大農紀 V(4)：213；相模図譜：25；動図：1083.

採集地：瀬戸・加太・塩屋.

11. *Dolabrifera dolabrifera* (RANG) ビワガタナメクジ

〔=*D. tahitensis* BABA〕馬場（1936），九大農紀 V(1)：12；相模図譜：27.

採集地：瀬戸.

12. *Notarchus* (*Notarchus*) *indicus armatus* BABA フウセンウミウシ

馬場（1938），九大農紀 VI(1)：4；相模図譜：28；動図：1082.

体をまるく膨まして，フウセンのように海中に浮ぶ奇習がある．瀬戸臨所鼻附近の岩礁では，時期的にかなり出現する.

13. *N.* (*Bursatella*) *leachii leachii* BLAINVILLE, *var. freeri* (GRIFFIN) フレリトゲアメフラシ

馬場（1937），九大農紀 V(4)：218；相模図譜：29；動図：1082.

採集地：和歌浦・瀬戸.

14. *N.* (*Stylocheilus*) *longicaudus* (QUOY & GAIMARD) クロスジアメフラシ（新稱）

〔=*N.* (*S.*) *stimpsoni* PILSBRY〕馬場(1936)，九大農紀 V(1)：14；馬場（1937），九大農紀 V(4)：221.

採集地：串本・瀬戸・浦神.

15. *Dolabella auricula* SOLANDER タツナミガイ

〔=*D. scapula* (MARTYN)〕馬場（1936），九大農紀 V(1)：15；相模図譜：30；動図：1082.

採集地：瀬戸.

III. Order Sacoglossa 嚢舌目

Suborder *Elysiacea* ゴクラクミドリガイ亞目

Family Stiligeridae ベルグウミウシ科

16. *Stiliger* (*Stiliger*) *boodleae* BABA アリモウミウシ

馬場（1938），九大農紀 VI(1)：7；相模図譜：31.

早春實驗所近傍のアオモグサ或はアオノリの上に無數に出現し，同時に産卵をする.

17. *Hermaea dendritica* (ALDER & HANCOCK) ミドリアマモウミウシ

馬場（1937），九大農紀 V(4)：223；動図：1077.

採集地：瀬戸.

Family Elysiidae ゴクラクミドリガイ科

18. *Elysia* (*Elysia*) *obtusa* BABA オトメミドリガイ

馬場（1938），九大農紀 VI(1)：8；相模図譜：35.

採集地：瀬戸.

19. *E.* (*E.*) *trisinuata* BABA ヒラミルミドリガイ

相模図譜：36.

採集地：串本・瀬戸.

同屬中には，なお2種の未査定種がある.

IV. Order Notaspidea 背楯目

Suborder *Pleurobranchacea* カメノコフシエラガイ亞目

Family Pleurobranchidae カメノコフシエラガイ科

20. *Berthellina delicata* (PEASE) ホウズキフシエラガイ

馬場（1937），九大農紀 V(4)：227；相模図譜：37；動図：1076.

採集地：瀬戸.

21. *Pleurobranchus* (*Oscanius*) sp. カメノコフシエラガイ

動図：1076.

採集地：瀬戸.

同屬中には体色白色のなお1種の未査定種がある.

22. *Pleurobranchaea novaezealandiae* CHEESEMAN ウミフクロウ

馬場（1937），九大農紀 V(4)：229；相模図譜：38；動図：1076；吉田（1950），南紀生物 I(4)：219.

採集地：瀬戸・加太・由良.

23. *P.* sp. ツノウミフクロウ

相模図譜：38.

足端に1個の角狀突起がある点で，容易に普通のウミフクロウと區別される.

採集地：瀬戸.

V. Order Nudibranchia 裸鰓目

A. Suborder *Doridacea* ウミウシ亞目

Superfamily Eudoridacea 眞正ウミウシ超科

Group Phanerobranchia 顯鰓ウミウシ群

Family Hexabranchidae ミカドウミウシ科

24. *Hexabranchus marginatus* (QUOY & GAIMARD) ミカドウミウシ

龍（1933），ヴイナス III(6)：346；馬場（1935），ヴイナス V(2-3)：100；馬場（1936），九大農紀 V(1)23；動図：1075.

印度洋及び太平洋の熱帶海域に分布する最も美しい代表的な種．沖繩・台湾等にも産する.

採集地：瀬戸・塩屋.

Family Euphuridae (=Polyceridae) カンザシウミウシ科

25. *Euphurus ornatus* BABA カンザシウミウシ（新稱）

馬場（1937），九大農紀 V(7)：289.

採集地：瀬戸.

26. *Gymnodoris citrina* (BERGH) キヌハダモドキ

馬場（1930），ヴイナス II(2)：46；馬場（1937），九大農紀 V(7)：292；相模図譜：40.

採集地：串本・瀬戸.

27. *G. alba* (BERGH) アカボシウミウシ

馬場（1930），ヴイナス II(2)：45；相模図譜：40.

採集地：瀬戸・加太.

28. *G. inornata* (BERGH) キヌハダウミウシ

馬場（1937），九大農紀 V(7)：292；相模図譜：41；動図：1074.

採集地：瀬戸・加太.

29. *G. subflava* BABA ウスギヌウミウシ

相模図譜：41.

採集地：瀬戸.

同屬中にはなお1種の未査定種がある.

30. *Nembrotha* sp.

相模湾産 リュウグウウミウシ *N. gracilis* BERGH〔相模図譜：42〕に酷似しているが未査定.

採集地：瀬戸.

31. *Kaloplocamus ramosus* (CANTRAINE) エダウミウシ

馬場 (1930), ヴイナス II(2): 43; 相模図譜: 42; 動図: 1074.

採集地: 瀬戸.

32. *Plocamopherus tilesii* BERGH ヒカリウミウシ

馬場 (1930), ヴイナス II(1): 5, 相模図譜: 43; 動図: 1074.

採集地: 瀬戸.

33. *P. imperialis* ANGAS ベツコウヒカリウミウシ

相模図譜: 44.

採集地: 瀬戸.

34. *Kalinga ornata* ALDER & HANCOCK ハナデンシヤ

馬場 (1930), ヴイナス II(1): 7; 動図: 1073.

採集地: 和歌浦・瀬戸・塩屋.

Family Okeniidae (=Goniodorididae) イバラウミウシ科

35. *Okenia* (*Okenia*) *japonica* BABA シロイバラウミウシ

相模図譜: 45.

採集地: 由良.

36. *Goniodoris castanea* ALDER & HANCOCK ネコジタウミウシ

馬場 (1930), ヴイナス II(2): 44; 馬場 (1937), 九大農紀 V(7): 294; 動図: 1073.

採集地: 瀬戸・加太.

37. *G. glabra* BABA コネコウミウシ

馬場 (1937), 九大農紀 V(7): 294; 相模図譜: 46.

採集地: 瀬戸.

38. *Hopkinsiella hiroi* BABA ヒロウミウシ

馬場 (1938): 九大農紀 VI(1): 10; 相模図譜: 47.

採集地: 瀬戸.

Family Vayssiereidae (=Okadaiidae) オカダウミウシ科

39. *Okadaia elegans* BABA オカダウミウシ

馬場(1930), ヴイナスII(2): 48; 馬場(1937), 輯報VII(2): 147; 相模図譜: 48; 吉田(1950), 南紀生物I(4): 221.

沿岸の轉石の下面に多産する微小種で, たいていいつでも産卵している. 直接發生をなす.

Group Cryptobranchia 隱鰓ウミウシ群

Family Doridiidae ドーリス科

40. *Glossodoris festiva* (ADAMS) アオウミウシ

相模図譜: 51; 動図: 1071.

採集地: 瀬戸・加太.

41. *G. pallescens* (BERGH) シロウミウシ

相模図譜: 50; 動図: 1071.

採集地: 瀬戸・加太.

42. *G. alderi* (COLLINGWOOD) サラサウミウシ

相模図譜: 49; 動図: 1072.

採集地: 瀬戸.

43. *G. aureopurpurea* (COLLINGWOOD) コモンウミウシ

相模図譜: 50; 動図: 1072.

採集地: 瀬戸.

44. *G. clitonota* (BERGH) セスジウミウシ

瀧 (1932), ヴイナス III(4): 215.

採集地: 瀬戸.

45. *G. marginata* (PEASE) ヒメイロウミウシ

馬場 (1938), 九大農紀 VI(1): 11.

採集地: 瀬戸.

46. *G. setoensis* BABA セトイロウミウシ

馬場 (1938), 九大農紀 VI(1): 12.

採集地: 瀬戸.

47. *G. placida* BABA ウスイロウミウシ

相模図譜: 52.

採集地: 瀬戸.

48. *G. maritima* BABA リュウモンイロウミウシ

相模図譜: 52.

採集地: 瀬戸.

同属中にはなお未査定種3種がある.

49. *Noumea nivalis* BABA シラユキウミウシ

馬場 (1937), 九大農紀 V(7): 298; 相模図譜: 54.

採集地: 瀬戸.

50. *Casella atromarginata* (CUVIER) キイロウミウシ

瀧 (1932), ヴイナス III(4): 214; 相模図譜: 55.

印度洋及び太平洋の熱帯海域に分布する代表的な種.

採集地: 瀬戸.

51. *Ceratosoma cornigerum* ADAMS & REEVE ニシキウミウシ

相模図譜: 56; 動図: 1071.

採集地: 瀬戸・名田.

52. *Cadlina japonica* BABA カドリナウミウシ

馬場 (1937), ヴイナス VII(2): 76; 相模図譜: 57.

採集地: 瀬戸.

53. *Actinocyclus japonicus* (ELIOT) アマクサウミウシ

馬場 (1937), 九大農紀 V(7): 300; 相模図譜: 60; 動図: 1070.

採集地: 瀬戸.

54. *Rostanga arbutus* (ANGAS) イソウミウシ

馬場 (1937), ヴイナス VII(1): 1; 相模図譜: 62; 動図: 1070.

採集地: 瀬戸・加太.

55. *Ctenodoris aurantiaca* (ELIOT) クシエラウミウシ

馬場 (1937), 九大農紀 V(7): 301; 相模図譜: 63; 動図: 1070.

採集地: 瀬戸.

56. *Neodoris tricolor* BABA サンシキウミウシ

馬場 (1938), 九大農紀 VI(1): 14; 相模図譜: 64.

採集地: 瀬戸.

57. *Trippa intecta* (KELAART) カイメンウミウシ

馬場 (1936), 九大農紀 V(1): 27; 相模図譜: 64.

採集地: 瀬戸.

58. *Geitodoris lutea* BABA ハケジタウミウシ（新稱）

馬場（1937），九大農紀 V（7）：302.

採集地：瀨戶.

59. *Thordisa parva* BABA ゴマフビロウドウミウシ

馬場（1938），九大農紀 VI（1）：15；相模図譜：65.

採集地：瀨戶.

60. *Discodoris concinna* (ALDER & HANCOCK) ツヅレウミウシ

相模図譜：65；動図：1069.

採集地：瀨戶.

61. *D. pardalis* (ALDER & HANCOCK) アミメツヅレウミウシ（新稱）

馬場（1933），彙報 XIV（2）：276；馬場（1937），九大農紀 V（7）：305.

採集地：瀨戶・加太.

62. *D. yaeyamensis* BABA ヤエヤマツヅレウミウシ（新稱）

馬場（1936），九大農紀 V（1）：30.

採集地：瀨戶・浦神.

63. *Homoiodoris japonica* BERGH ヤマトウミウシ

相模図譜：66；動図：1069.

採集地：瀨戶.

64. *Halgerda japonica* ELIOT ニクイロウミウシ

相模図譜：67；動図：1069.

採集地：瀨戶.

65. *H. rubicunda* BABA ヒオドシウミウシ

相模図譜：67.

採集地：瀨戶.

66. *Argus cruentus* (QUOY & GAIMARD) ユウゼンウミウシ（新稱）

馬場（1936），九大農紀 V（1）：35.

採集地：瀨戶.

67. *A. speciosus* (ABRAHAM) クモガタウミウシ

相模図譜：67；動図：1068.

初夏の候各地岩礁に美しい橙黄色のリボン狀の卵塊をすこぶる多量に産みつける.

採集地：瀨戶.

68. *A. tabulatus* (ABRAHAM) ネズミウミウシ

相模図譜：68；動図：1068.

採集地：瀨戶.

69. *Dendrodoris* (*Dendrodoris*) *nigra* (STIMPSON) クロシタナシウミウシ

相模図譜：69；動図：1067.

採集地：瀨戶・加太.

70. *D.* (*D.*) *gemmacea* (ALDER & HANCOCK) ミヤコウミウシ

馬場（1937），九大農紀 V（7）：309；相模図譜：69.

採集地：瀨戶.

71. *D.* (*D.*) *rubra* (KELAART), var. *nigromaculata* (ELIOT) マダラウミウシ

相模図譜：70；動図：1067.

背腹面共著しく黑色を帶びた色彩變異種がある.

採集地：瀨戶.

72. *D.* (*D.*) *guttata* (ODHNER) ヒメマダラウミウシ

馬場 (1933), 彙報 XIV (1): 173; 馬場 (1937), 九大農紀 V (7): 309; 相模図譜: 70.

採集地: 瀬戸.

73. *D.* (*Doriopsilla*) *miniata* (ALDER & HANCOCK) ダイダイウミウシ

馬場 (1937), 九大農紀 V (7): 309; 相模図譜: 71; 動図: 1068.

採集地: 瀬戸.

Family Phyllidiidae イボウミウシ科

74. *Phyllidia* (*Phyllidiella*) *nobilis* (BERGH) オウイボウミウシ (新稱)

馬場 (1936), 九大農紀 V (1): 41.

本種は沖繩・小笠原等にも産し, 熱帶系の代表的種の一つ.

採集地: 瀬戸.

B. Suborder *Arminacea* タテジマウミウシ亞目

Superfamily Euarminacea 眞正タテジマウミウシ超科

Family Arminidae タテジマウミウシ科

75. *Dermatobranchus* (*Dermatobranchus*) *striatus* (VAN HASSELT) オトメウミウシ

馬場 (1937), 九大農紀 V (7): 316; 相模図譜: 73; 動図: 1066.

採集地: 瀬戸.

76. *D.* (*D.*) *striatellus* BABA サメジマオトメウミウシ

相模図譜: 74.

採集地: 瀬戸.

77. *Armina* (*Armina*) *taeniolata* (BERGH) ハスエラタテジマウミウシ (新稱)

馬場 (1937), 九大農紀 V (7): 318.

採集地: 塩屋.

C. Suborder *Dendronotacea* スギノハウミウシ亞目

Family Duvauceliidae ホクヨウウミウシ科

78. *Marionia olivacea* BABA ミドリウミウシ

馬場 (1937), ヴイナス VII (3): 117; 相模図譜: 86.

採集地: 加太.

Family Bornellidae ユビウミウシ科

79. *Bornella digitata* ADAMS & REEVE ユビウミウシ

相模図譜: 88; 動図: 1065.

採集地: 瀬戸・三尾.

Family Scyllaeidae オキウミウシ科

80. *Notobryon wardi* ODHNER ユメウミウシ

馬場 (1937), 九大農紀 V (7): 321; 相模図譜: 90; 動図: 1064.

採集地: 瀬戸・串本.

81. *Crosslandia viridis* ELIOT コチヨウウミウシ (新稱)

馬場 (1937), 九大農紀 V (7): 324.

採集地: 瀬戸.

Family Phylliroidae コノハウミウシ科

82. *Cephalopyge orientalis* BABA ササノハウミウシ

馬場（1933），彙報 XIV（1）：157；動図：1064.

瀬戸では宮下義信氏が1935年に採集して以來まだとれない．海洋浮遊性．

Family Tethyidae (=Fimbriidae) ムカデメリベ科

83. *Melibe vexillifera* BERGH ムカデメリベ

相模図譜：93；動図：1064.

採集地：瀬戸.

84. *M. papillosa* (DE FILIPPI) ヒメメリベ

相模図譜：92.

採集地：瀬戸.

85. *M. japonica* ELIOT ヤマトメリベ

馬場（1933），彙報 XIV（1）：175；相模図譜：93.

採集地：瀬戸.

Family Dotonidae マツカサウミウシ科

86. *Doto* (*Doto*) *japonica* ODHNER マツカサウミウシ

相模図譜：94；動図：1063.

採集地：瀬戸.

87. *D.* (*D.*) *bella* BABA コガネマツカサウミウシ

馬場（1938），彙報XVII（2）：132；相模図譜：94.

採集地：由良・瀬戸.

D. Suborder *Eolidacea* ミノウミウシ亞目

Superfamily Acleioprocta 背肛超科

Family Tergipedidae テルギーペス科

88. *Cratena ornata* (BABA) フジエラミノウミウシ（新稱）

馬場（1937），九大農紀 V（7）：331.

採集地：加太.

Family Flabellinidae フラベリナ科

89. *Samla*（？）*ornata* (RISBEC) サキシマミノウミウシ（新稱）

〔=*Coryphella ornata* RISBEC〕馬場（1936），九大農紀 V（1）：44.

沖繩産の標本について *Coryphella* 屬に編入したが，再査の結果 *Samla* 屬の方へ移した方がよいのではないかと考える．この点なお研究を要する．

採集地：瀬戸.

Family Fionidae ヒダミノウミウシ科

90. *Fiona pinnata* (ESCHSCHOLTZ) ヒダミノウミウシ

相模図譜：101；時岡（1952），本誌：13.

昭和26年6月に時岡博士が瀬戸海岸に漂着した竹の上から多數の個体を採集し，かつその産卵習性を觀察した．

Superfamily Cleioprocta 後肛超科

Family Facelinidae フアセリナ科

91. *Favorinus japonicus* BABA チゴミノウミウシ

相模図譜：101.

採集地：瀬戸.

92. *Hervia ceylonica* FARRAN セイロンミノウミウシ

相模図譜：104; 動図：1063.

採集地：瀬戸・加太.

93. *H. lineata* ELIOT ハクセンミノウミウシ

馬場（1938），九大農紀 VI（1）：17; 相模図譜：103.

採集地：瀬戸.

94. *H. inconspicua* (BABA) セトミノウミウシ（新稱）

馬場（1938），九大農紀 VI（1）：18.

採集地：瀬戸.

95. *H. serrata* BABA サガミミノウミウシ

相模図譜：105.

採集地：瀬戸.

96. *Herviella yatsui* (BABA) ヤツミノウミウシ

馬場（1930），ヴイナス II（3）：121; 馬場（1937），九大農紀 V（7）：328; 相模図譜：107.

採集地：瀬戸・三崎.

97. *Pteraeolidia semperi* (BERGH) ムカデミノウミウシ

相模図譜：110.

採集地：瀬戸.

Family Aeolidiidae オウミノウミウシ科

98. *Aeolidiella japonica* ELIOT ヤマトミノウミウシ

馬場（1930），ヴイナス II（3）：123; 相模図譜：111.

採集地：瀬戸.

99. *A. takanosimensis* BABA ミノウミウシ

馬場（1930），ヴイナス II（3）：122; 相模図譜：111; 動図：1062.

採集地：瀬戸.

Family Glaucidae アオミノウミウシ科

100. *Glaucus* (*Glaucus*) *marinus* (DUPONT) アオミノウミウシ

相模図譜：114; 動図：1062.

海洋浮遊性で，体色は紺青色をしている.

採集地：瀬戸・塩屋.

〔附 記〕

1. 本目錄に收載している後鰓類の総種数は馬場（1938）のそれに比し，約30種を增している．學名はすべて相模湾産後鰓類圖譜に準據して訂正した.
2. 吉田（1950），南紀生物 I（4）：219 の種名不詳の種は恐らく學界の未知種であつて，學名は未詳である.
3. 下記を追加する.

88′. *C. pinnifera* BABA ツノバネミノウミウシ

相模図譜：99.

採集地：瀬戸.

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NANKI-SEIBUTSU SUPPLEMENT
No. 1 (April, 1952)

ヒダミノウミウシ Fiona pinnata (Eschscholtz) の記錄

時　岡　　隆

京大瀨戸臨海實驗所

(昭和26年8月20日受領)

今年 (1951) 6月1日の午下り，4才半になる息子の隆志が1米近い竹竿を振り振り意氣揚々として外から歸つて來た．そして，私の顏を見るなり“標本，標本”と言い乍ら，それを私の鼻先に突きつけたのである．その竿には，エボシガイが密生しており，それがまだ生きている證據には，パクパクやつている介の間から黑い蔓脚をのぞかせている．さては，親の言いつけに背いて，独りで危い海に遊びに行つたなと，一天にわかにかき曇り，雷鳴はためく寸前，白いエボシガイの介の間を匐い廻つている褐色の虫が私の注意をひいた．よくみると，それはウミウシである．一匹ではない．詳しく記すと，長さ865mm×徑35mmの竿の上に，何と大小77匹がうごめいているではないか．フムこれはどうも海岸の產ではないらしい，エボシガイと共に遠洋を漂つているものであろうと急ぎそれをガラス鉢に移した．雷を忘れている私に，さてこそこれは思つた通りの手柄ぞと，息子は得意滿面，“實驗所の南の濱に打寄せられたのを拾つたのだが，竹と一緒にこのお魚がいた”と握りしめた掌を開いて，あわれ子供の体溫に同じく溫められた10cm大の小魚を示す．正しく所謂 Pilot-fish である．他に一匹いたが，それはお隣りの子供と仲良く一匹づつ分けた由，早速聞きに走らせたが，家で“食べられない”と言われて海に捨てた後であつた．さてその竹の上には，処々に徑10mm迄の白い卵塊がついている．どうもそれは軟体動物のものらしい．これが件のウミウシの卵塊である可能性もあるわけなので，これも大切にガラス鉢に移しておいたが，夕刻ウミウシが全く同じ卵塊をガラス壁に產みつけたので，この点は確實となつた．

一方ウミウシの素性を洗うべく，相模湾產後鰓類圖譜を繰つてみると，101頁 (第131—132圖，第43圖版—149圖) に記してあるヒダミノウミウシにピツタリと符號した．記事によれば，遠洋浮游性とあり，葉山で漁具上を匐つていたものが一匹だけ採れた由，他に日本よりの記錄がないから，稀なものに違いない．十分伸びたものは35mm位の長さがある．体は白色，鰓突起は暗褐色で，これに透明なヒダ (2圖) がついている．他に背面に四條の同色の縱線があるが，これらの色調は，肝臟の色素に基くものである．他のウミウシと同じく，水面に懸垂して匐い廻る事は出來るが，決して水中を游泳する事はない．從つて，遠洋浮游性と言う言葉は，エボシガイ等と同樣の意味に於て受取られるべきである．ところで，產みつけた卵塊を調べてみると，圖版の5に示した樣な幅廣いものが，1卷—1卷半まいているが，その上緣はわずかに內方に曲り，結局3に見るような球狀を呈する事が判る．必ず一部に短い附着部がある．1日の夕刻に產みつけられた卵塊は白く不透明であつたが，日と共に透明になり，7日の正午前後になると，ドロドロに壞れた卵塊の中から數多の被面子が泳ぎ出して來た．幼虫は明瞭な趨光性を示す．幼虫は日々水を取換えてみたが，4～5日で死滅してしまう．顯微鏡でみると，食物がないためか胃が收縮して了つている他に，纖毛虫のある種類がさかんにこの幼虫を襲撃しているのが見られる．被面子は300ミクロン足らずの卵形，透明，無彫刻の薄殼を有し，圖版に示したように半円形の足 (f.) の裏に密着した蓋 (op.) を有している．足は周圍に5本の棘毛を具え，端部の中央には，ほぼ三角狀の纖毛域が見られる．蓋を位相差顯微鏡で檢すると，これが右卷きの寡旋蓋であり，その左後端は相對する殼軸部 (col.) と共に，他部に比べてやや肥厚している事が判る．殼と蓋の卷き方が必ず相反するものであるならば，このウミウシの殼は，もし卷けば左卷きであることとなる．面盤は單純な圓扇型，胃 (st.) には大きな左肝臟 (l. l.) と小さな右肝臟

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(r.l.) とが附着している．右側に開く肛門 (an.) の近くには幼体腎臓 (l.k.) が見られるが，これは2葉に分れているように見えた．

さて，珍しいウミウシについてこれだけの観察をした私は，鬼の首でもとつた様な氣持で，馬場教授に早速この旨を知らせると共に，孵化までの種々な時期の卵塊が保存してあるが，それを檢して，被面子が生ずるまでの過程を調べる價値があるかないかを聞き合せたところ，Proceedings of the Academy of Natural Sciences of Philadelphia, Vol. LVI (Part 2), pp. 325—405, Pl. 21—35 (1904) に出ている Casteel, D.B. の The cell-lineage and early larval development of Fiona marina, a Nudibranch Mollusk と言う論文が，被面子の生ずるまでの卵中の過程を詳しく盡しているが，卵塊についての詳しい記述は全く知らないとのことであつた．そこで，波部さんの御好意で，同書を京大の地質學教室から借出して載き參照した結果，なるほど卵割や種々の器官の起源については，實に詳しく記してあつたが，被面子は保存したものについての研究であるため，殻や膠などの正確な圖もなく，またこんな珍しいウミウシを材料としてこの様な研究を成し遂げたいきさつについては，327頁の Material and Methods の項に，

> For the material upon which this study has been made, I am indebted to Drs. E. G. Conklin and M. A. Bigelow, by whom it was collected at Woods Hole, Massachusetts, during the summer of 1897 and 1898. The Nudibranchs were found spawning upon floating gulf-weed in Vineyard Sound, taken to the Laboratory and kept in aquaria for some weeks, where they spawned prolifically and where, from day to day, the eggs were collected and preserved.

と記してある．また，かの1845—1910に亘り Alder, Hancock 兩氏の麗筆になる図を基に Eliot 氏が書き上げた大冊 Monograph of the British Nudibranchiate Mollusca を見ると，Vol. II の Fam. 3, Plate 38A の説明に，本種 (Fiona nobilis Alder & Hancock) は1850年8月の大潮時，W. P. Cock 氏が Falmouth, Bar Point の干潮線附近で見出したものであり，

> Some patches of spawn were found along with these, deposited on the surface of the stone. It was composed of a broad band of ova, forming a single coil, or a coil and a half, and curved inwards at the top, so as to give it a spherical form.

と，図はないが，前に私が記した卵塊そのままの記述が與えてある．また Part 7 (1910) の5頁には，Fiona marina の色はカツオノカンムリ (Velella) を喰えば灰青色となり，若い有柄蔓脚類 (多分エボシガイ類) を喰えば淡褐色を呈すると書いてあるが，Falmouth の標本も白濱で採れたものと同じく褐色に彩つてある．

結局，この稿から卵塊の正確な図と，被面子の殻及び膠についての正確な記述及び圖を見とつていただけたら十分なわけである．なお，ついでに，この竹竿號の乘組員を記すと，

1. ヒドロゾア……多数
2. 多毛類……2種？ 4匹
3. ワレカラ Caprella acutifrons Latreille (內海博士同定) ……約20匹
4. エボシガイ Lepas anatifera Linné (內海博士同定) ……多数
5. フナクイムシ……1種，相當数
6. 巻貝……1種，1匹
7. ヒダミノウミウシ……77匹

の大勢で，2匹の Pilot fish アイブリ Seriolina intermedia (Temminck et Schlegel) が水先案內となつて漂つていたものである．多分，2匹のパイロツトが互に論を闘わせ，ために船頭が多くて山に上つた船の譬どおり，砂濱に乘り上げた始末となつたのでしよう，と私は冗談まじりの上氣嫌で，この日はとうとう叱言を忘れ果てたのであつた．

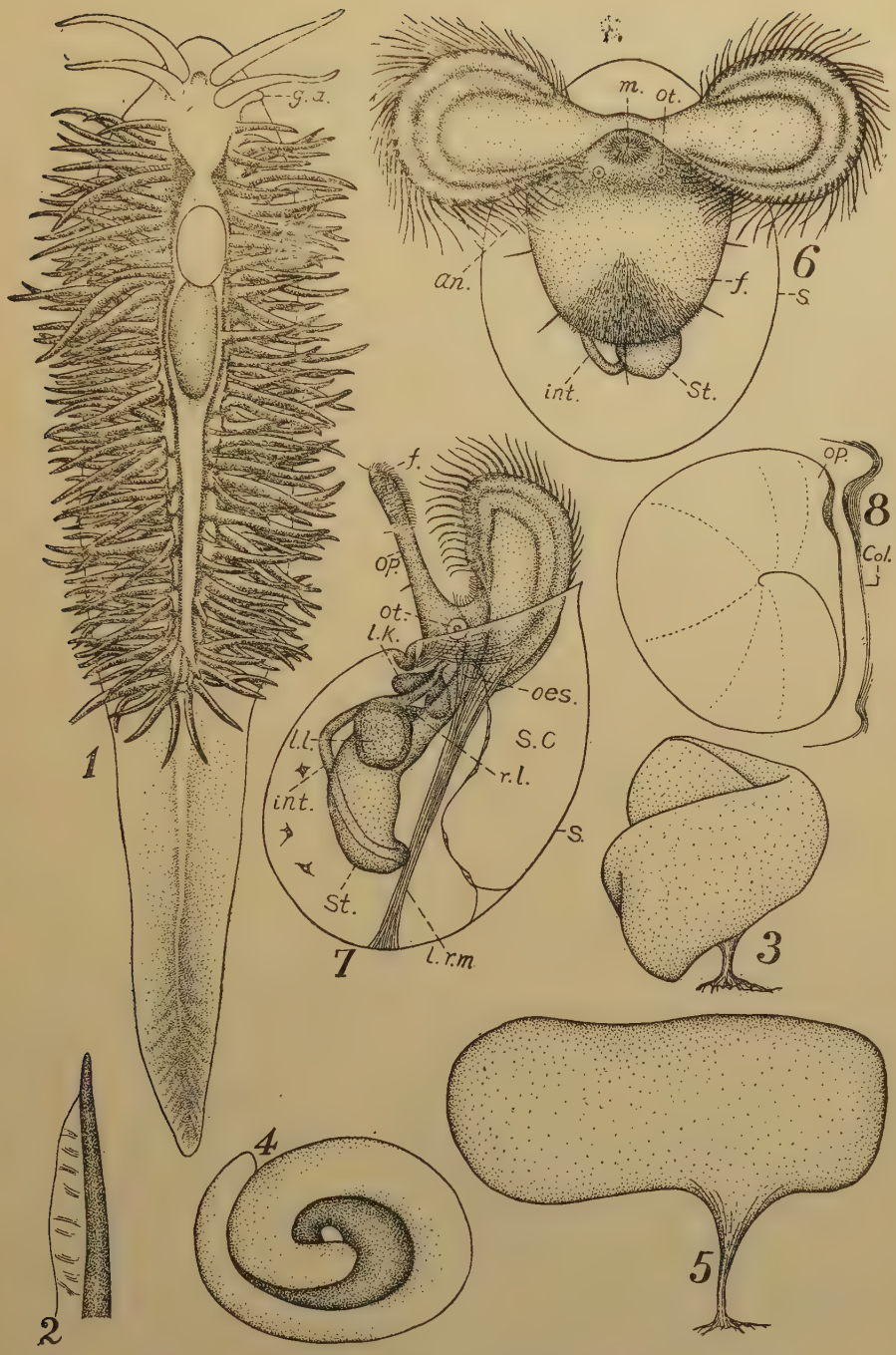

圖　版　說　明（ヒダミノウミウシ）

1. ……全形背面　　2. ……鰓突起（ヒダを示す）擴大　　3. ……卵塊側面
4. ……卵塊上面　　5. ……卵塊を擴げたところ　　6. ……被面子，前面より×200
7. ……被面子，左側面×200　　8. ……囊と殻軸部×300

an.…肛門，col.…殻軸，f.…足，g.a.…生殖腺開口，int.…腸，l.k.…幼体腎臟，l.l.…左肝臟，l.r.m.…左牽引筋，m.…口，oes.…食道，op.…囊，ot.…平衡器，r.l.…右肝臟，s.…殻，s.c.…殻中に引入れた面盤部のおさまるところ，st.…胃

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Chaetognaths of the Indo-Pacific

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(*Communicated by* T. KOMAI)

1. Species occurring in the Indo-Pacific.

The following 75 names of Chaetognatha are found in reports dealing with this animal group in the Indo-Pacific to this date.

List 1

1. *Bathyspadella edentata* Tokioka 1939
2. *Eukrohnia fowleri* Ritter-Záhony 1909
2. *Eukrohnia hamata* (Möbius) 1875
4. *Eukrohnia hamata* var. *antarctica* Johnston & Taylor 1921
5. *Eukrohnia richardi* Germain & Joubin 1912
6. *Krohnia foliacea* Aida 1897
7. *Krohnia viridis* Aida 1897
8. *Krohnitta kerberti* Oye 1918
9. *Krohnitta pacifica* (Aida) 1897
10. *Krohnitta subtilis* (Grassi) 1881
11. *Pterosagitta draco* (Krohn) 1853
12. *Sagitta ai* Tokioka 1939
13. *Sagitta australis* Johnston 1909
14. *Sagitta bedfordii* Doncaster 1902
15. *Sagitta bedoti* Béraneck 1895
16. *Sagitta bedoti* forma *minor* Tokioka 1942
17. *Sagitta bipunctata* Qouy et Gaimard 1827
18. *Sagitta bombayensis* Lele & Gae 1936
19. *Sagitta californica* Michael 1913
20. *Sagitta coreana* Moltschanoff 1907

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Contribution No. 174

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21. *Sagitta crassa* Tokioka 1938
22. *Sagitta crassa* forma *naikaiensis* Tokioka 1939
23. *Sagitta decipiens* Fowler 1905
24. *Sagitta delicata* Tokioka 1939
25. *Sagitta elegans* Verrill 1873
26. *Sagitta enflata* Grassi 1881
27. *Sagitta ferox* Doncaster 1902
28. *Sagitta flaccida* Conant 1895
29. *Sagitta fowleri* Benham 1912
30. *Sagitta furcata* Steinhaus 1896
31. *Sagitta gardineri* Doncaster 1902
32. *Sagitta gazellae* Ritter-Záhony 1909
33. *Sagitta hexaptera* d'Orbigny 1834–1844
34. *Sagitta hispida* Conant 1895
35. *Sagitta japonica* Galzow 1909
36. *Sagitta lacunae* Tokioka 1942
37. *Sagitta levis* Galzow 1909
38. *Sagitta longicauda* Galzow 1909
39. *Sagitta lyra* Krohn 1853
40. *Sagitta macrocephala* Fowler 1905
41. *Sagitta magna* Langerhans 1880
42. *Sagitta minima* Grassi 1881
43. *Sagitta moreauensis* Gray 1923
44. *Sagitta neglecta* Aida 1897
45. *Sagitta oceanica* Gray 1930
46. *Sagitta orientalis* Moltschanoff 1907
47. *Sagitta parva* Oye 1918
48. *Sagitta philippini* Michael 1919
49. *Sagitta planctonis* Steinhaus 1896
50. *Sagitta polyodon* Doncaster 1902
51. *Sagitta pseudoregularis* Oye 1918
52. *Sagitta pseudoserratodentata* Tokioka 1939
53. *Sagitta pulchra* Doncaster 1902
54. *Sagitta rapax* Moltschanoff 1907
55. *Sagitta regularis* Aida 1897
56. *Sagitta robusta* Doncaster 1902
57. *Sagitta septata* Doncaster 1902
58. *Sagitta serratodentata* Krohn 1853
59. *Sagitta serratodentata* forma *atlantica* Tokioka 1940
60. *Sagitta serratodentata* forma *pacifica* Tokioka 1940
61. *Sagitta serratodentata* forma *tasmanica* Thomson 1947

62. *Sagitta sibogae* Fowler 1906
63. *Sagitta tenuis* Conant 1896
64. *Sagitta trichodermis* Oye 1918
65. *Sagitta tricuspidata* Kent 1870
66. *Sagitta triptera* d'Orbigny 1834–1844
67. *Sagitta tropica* Tokioka 1942
68. *Sagitta tumida* Tokioka 1939
69. *Sagitta weberi* Oye 1918
70. *Sagitta zetesios* Fowler 1905
71. *Spadella cephaloptera* (Busch) 1851
72. *Spadella moretonensis* Johnston & Taylor 1919
73. *Spadella schizoptera* Conant 1895
74. *Spadella vougai* Béraneck 1895
75. *Zahonya cestoda* Oye 1918

This list, however, includes many synonyms and names of doubtful or imperfectly described species. Thus it is reducible to the 36 species listed below:

List 2

Species with one asterisk are found exclusively in the Indo-Pacific. Species with two asterisks are of *Neglecta*-group. Those without any mark are cosmopolitan forms.

* 1. *Bathyspadella edentata*
2. *Eukrohnia hamata* (*E. hamata* var. *antarctica*, *E. richardi*, *Krohnia foliacea*)
* 3. *Krohnitta pacifica* (*K. kerberti*, *K. viridis* is Aida's misrecord for *K. pacifica*)
4. *Krohnitta subtilis*
5. *Pterosagitta draco* (*Spadella vougai*)
** 6. *Sagitta bedfordii* (*S. pseudoregularis*)
*7. *Sagitta bedoti*
*8. *Sagitta bedoti* forma *minor* (*S. polyodon?*)
9. *Sagitta bipunctata* (*S. californica*)
Based on the description given by Ritter-Záhony in 1911.
*10. *Sagitta bombayensis*
**11. *Sagitta crassa*
**12. *Sagitta crassa* forma *naikaiensis*
13. *Sagitta decipiens* (*S. philippini*, *S. sibogae*)
**14. *Sagitta delicata*
15. *Sagitta elegans* (*S. flaccida* of Galzow, *S. rapax*)
16. *Sagitta enflata* (*S. australis*, *S. flaccida* of Doncaster, *S. gardineri*)

17. *Sagitta ferox* (*S. hispida* of some authors, *S. japonica*, *S. robusta* of many authors)
18. *Sagitta hexaptera* (*S. fowleri*, *S. magna*, *S. tricuspidata*, *S. triptera?*)
19. *Sagitta lyra* (*S. furcata*, *S. gazellae*)
20. *Sagitta macrocephala*
21. *Sagitta minima*

**22. *Sagitta neglecta* (*S. septata*, *S. trichodermis*)

**23. *Sagitta oceanica* (*S. lacunae*)

This species became known to me through sketched figures and typewritten descriptions kindly supplied by Dr. J.M. Thomson. This species has been reported from the Society Islands and seems to be an inhabitant of coastal or lagoon waters.

**24. *Sagitta parva*

25. *Sagitta planctonis* (*S. moreauensis*, *S. zetesios*)

*26. *Sagitta pulchra* (*S. weberi*)

**27. *Sagitta regularis*

?*28. *Sagitta robusta* (*S. ai*)

*29. *Sagitta serratodentata atlantica* f. *pseudoserratodentata*

*30. *Sagitta serratodentata atlantica* f. *tasmanica*

31. *Sagitta serratodentata atlantica* f. *typica*

*32. *Sagitta serratodentata pacifica*

S. s. pacifica differs distinctly from the three other forms in that the seminal vesicle has many chitinous teeth along the antero-lateral edge and in that the teeth, especially the posterior teeth, are very numerous as shown in the next table.

	S. s. pacifica	*S. s. atlantica*		
		f. *pseudoserrato-dentata*	f. *tasmanica*	f. *typica*
Body length	up to 16 mm	9 mm	20 mm	17 mm
Seminal vesicle	With 4-10 chitinous teeth at antero-lateral corner.	With a pointed antero-lateral corner.	Without any pointed projection at antero-lateral corner.	With 2 papillae at antero-lateral corner.
TOOTH FORMULA				
6-8 mm long individuals	6-8 $\frac{7-9}{10-17}$	5-7 $\frac{4-6}{10-13}$	6-8 $\frac{2-4}{5-8}$	6-9 $\frac{4-7}{8-14}$
8-10 mm	6-8 $\frac{7-10}{15-25}$	6-7 $\frac{5-8}{12-15}$	6-9 $\frac{4-7}{6-12}$	7-8 $\frac{5-8}{8-14}$
10-12 mm	5-7 $\frac{7-11}{17-25}$	—	6-8 $\frac{6-8}{10-12}$	5-8 $\frac{7-9}{11-14}$
12-14 mm	5-7 $\frac{8-13}{18-24}$	—	6-8 $\frac{6-8}{11-16}$	5-7 $\frac{7-10}{11-14}$
>14 mm	5-6 $\frac{9-10}{19-22}$	—	6-8 $\frac{7-9}{13-19}$	No data

In previous papers, I have described the corona ciliata of *S. pseudo-serratodentata* as beginning behind the eyes, and I gave this feature to be characteristic of this species (1939, 1940). Recently, I have re-examined 20 individuals collected near Seto in the winter of 1938-39, and obtained the following result as to this feature :—

Corona ciliata starts	in front of the eyes	.....	6 indiv.
〃	〃	between the eyes	..... 5 〃
〃	〃	behind the eyes	..... 6 〃
〃	〃	indistinct	..... 3 〃

The corona ciliata in Type B commonly begins in front of the eyes and extends to the anterior region of the trunk. It varies, however, considerably in position, especially in small-sized specimens.

**33. *Sagitta tropica*

**34. *Sagitta tumida*

35. *Spadella cephaloptera*

36. *Spadella schizoptera*

In addition to the above 36, there are the following 8 doubtful species:

1. *Eukrohnia fowleri* Ritter-Záhony Some investigators consider this species to be identical with *E. hamata* (Tokioka 1939?, Thomson 1947).

2. *Sagitta coreana* Moltschanoff The formula of this species examined in 9–10 mm-long individuals is: $8\text{–}9\ \frac{7\text{–}9}{16\text{–}22}$. This resembles closely that of *S. crassa* f. *naikaiensis*. Thus, it is possible that *S. c.* f. *naikaiensis* is synonymous with *coreana*. It is desirable that the type specimen of *coreana* be reexamined for the features of the animal other than the tooth formula, which has been so imperfectly described.

3. *Sagitta levis* Galzow This species from Vladivostock and Petropawlowsk, with 9–10 mm body length, and with the formula $8\text{–}9\ \frac{3\text{–}5}{(5)\,7\text{–}13}$, reminds us of young individuals of *S. elegans* occurring abundantly in the Liman Current, but never attaining maturity until they grow over 10 mm. On the other hand, *S. crassa* f. *naikaiensis*, which attains maturity at about 10 mm in body length, has been recorded from the eastern coast of Tyôsen beyond 40°N. Thus it is possible that the present species represents an ecological form of *S. crassa*, a coastal-water chaetognath, although the tooth formula differs considerably between the two, the posterior teeth being much more numerous in *crassa* than in *levis*.

4. *Sagitta longicauda* Galzow This species, which is known by a single specimen collected off Vladivostock, is apparently to be considered an individual variety of the preceding species, being provided

with a thickened collarette. The presence of this structure shows a close relationship between this species and *S. crassa*.

5. *Sagitta orientalis* Moltschanoff A specimen found by Moltschanoff from Tschemulpo of Tyôsen, measured 18.5 mm in body length, with the tail being 1/4 the body length, and tooth formula 8 $\frac{5?}{20?}$. These features remind one of *S. elegans*, which species is, however, unknown from the Yellow Sea, whence *S. bedoti* and *S. crassa* only have been recorded.

6. *Sagitta tenuis* Conant Johnston and Taylor (1919) reported from Port Jackson a specimen referrable to this small-sized (less than 6 mm) species which was previously recorded from Jamaica, and considered by Ritter-Záhony as identical with *S. bipunctata*. The tooth formula 7–8 $\frac{4–5}{7–10}$ resembles that of *S. neglecta* and *S. oceanica*, as well as of *S. bipunctata*. The former two species, however, are not yet known with certainty from the Atlantic.

7. *Spadella moretonensis* Johnston & Taylor Probably a form of *Sp. cephaloptera*.

8. *Zahonya cestoda* Oye It is a noteworthy fact that some species with strongly developed musculature assume an appearance, when they are in a slightly contracted state, as if they were provided with a transverse musculature along the whole body. Thus, this species is possibly no more than a small individual of *S. robusta* (or *S. ferox*) in such a state.

II. The proportion of the number of Indo-Pacific species to all the species recorded from the world.

Of the species recorded from seas other than the Indo-Pacific, the following 6 are valid.

From the Atlantic	1. *Krohnittella boureei* Germain & Joubin 1912
" " "	2. *Sagitta friderici* Ritter-Záhony 1911
" " "	3. *Sagitta helenae* Ritter-Záhony 1910
" " "	4. *Sagitta setosa* Müller 1847
From the Black Sea	5. *Sagitta euxina* Moltschanoff 1909
From the Antarctic	6. *Heterokrohnia mirabilis* Ritter-Zánony 1911

Besides, there are the following 3 doubtful species.

From the Atlantic 1. *Sagitta maxima* (Conant) 1896

Some authors consider this species as a synonym of *S. lyra* (Michael 1911, Tokioka 1929 ?).

From the Mediterranean Sea

2. *Spadella musculosa* Doncaster 1903
3. *Spadella profunda* Doncaster 1903

Thus, the Indo-Pacific has nearly 6/7 of all the valid species of Chaetognatha. If doubtful species are included, there are altogether 53 species, of which 44 are found in the Indo-Pacific. Of these 44, 36 are considered valid ones, and 20 indicated with asterisk in the above list No. 2 are found exclusively in this region. Gray (1923), on the basis of the material collected by Dr. Moreau during his voyage from England to Australia, reported *S. neglecta*, *S. pulchra* and *S. regularis* from the Atlantic. These records are, however, somewhat dubious, because his descriptions of these animals are rather inadequate. Moreover, the validity of all his new species is doubted by subsequent workers; i.e. *S. atlantica*=*S. minima*?, *S. equatoria*=*S. ferox*, *S. moreauensis*=*S. planctonis*; and the record of *S. setosa* from the waters off the coast of West Africa at 15°N is also questionable.

On the other hand, the Atlantic and the Mediterranean, including the Black Sea, sustain 21 valid species (about 1/2 of all valid species, i.e. 24/53 of the world's species including doubtful ones). Among these 21, only 5 species are found exclusively in these regions. It may be safely said that the Indo-Pacific is occupied by the greater part of the chaetognath fauna in the world.

III. Characteristics of the Indo-Pacific Chaetognath Fauna.

Besides the rich variety of species and the existence of many endemic species in the Indo-Pacific, the following facts may be noticed with interest.

(1) The existence of the *Neglecta*-group. Among the 20 endemic species, 10 belonging to *Sagitta* (indicated with two asterisks in list 2) form a peculiar group characterized by corona ciliata belonging to Type C (i.e., beginning behind the eyes and reaching the end of the neck, or the anterior part of the trunk), the absence of the rayless-zone on the fin, and the situation of the seminal vesicle nearer the posterior fin than the caudal fin. This group became known for the first time through Aida's paper, in which *S. neglecta* and *S. regularis* are described. I propose here to call the group the *Neglecta*-group. None belonging to this group has been reported with certainty from other parts of the world.

(2) Absence of *Sagitta setosa*. *S. setosa* is known as the only representative of the coastal-water chaetognath found in the northern

Europe. This species is replaced in the north-western Pacific by *S. crassa* and its allies, all belonging to the *Neglecta*-group. These are *S. tumida* from the brackish lake of Hokkaidô, *S. crassa* and *S. c.* f. *naikaiensis* occurring around Honsyû, Tyôsen and the Shantung Peninsula, *S. delicata* from the western-southern coast of Honsyû and Kyûshû and *S. bedfordii?*, *S. oceanica* and *S. tropica* from the coastal waters in the tropical region. Thus, most of the members of the *Neglecta*-group are coastal or inlet-water forms. Only three, *S. regularis*, *S. neglecta* and *S. parva?*, are oceanic species.

(3) The existence of some morphological differences between the Indo-Pacific and Atlantic forms found in several species. The differences found in *S. serratodentata* have been fully discussed already (Tokioka 1939, 1940; Thomson 1947). *S. bipunctata* also assumes different appearances in the Atlantic and in the Indo-Pacific. Perfectly preserved specimens of the Indo-Pacific forms have a conspicuous swelling of the "collarette" in front of the seminal vesicle as indicated in the description of *S. californica* by Michael (1913), as well as in works by Tokioka (1939) and by Thomson (1947). This structure is missing in the North-Atlantic forms (Fraser 1949), although the Mediterranean specimens collected near Villefranche are provided with such a structure (Ghirardelli 1950).

IV. General consideration on the Indo-Pacific Chaetognath Fauna.

It is a well-known fact that the Indo-Pacific maintains many more warm-water species in various animal groups than the Atlantic. Also many more endemic forms are found in the former than in the latter region. This fact is explained generally by Ortmann-Meisenhaimer's biogeographic theory. The characteristics of the Indo-Pacific chaetognath fauna mentioned above seem to accord well with this theory.

From this view-point, the Indo-Pacific chaetognaths may be classified roughly as follows:

1) Oceanic water form.
   - a. Northern cold-water form.....*S. elegans*
   - b. Warm-water forms.....*S. enflata*, *S. bedoti*, *S. serratodentata*, *S. ferox*, *S. regularis*, *S. minima* etc.
   - c. Deep-water forms occurring in the warm region...*S. macrocephala*, *S. decipiens* etc.
   - d. Found in the deep waters of the warm region and in the surface waters of the southern cold region... *S. planctonis*

e. Found in the deep waters of the warm region and in the surface waters of both the northern and southern cold regions .....*E. hamata*

2) Coastal or inlet-water form.

a. Found in northern cold region.....*S. tumida, S. levis?, S. longicauda?*

b. Found in temperate region.....*S. crassa, S. c.* f. *naikaiensis, S. delicata*

c. Found in tropical region .....*S. bedfordii?, S. tropica, S. oceanica, S. bombayensis.*

3) Littoral form.....*Spadella*

Sp. cephaloptera seems to be widely distributed in European waters. In Japan it is known from the coastal waters of Tateyama, Misaki and Kii Peninsula on the Pacific coast, the Inland Sea and from the coast around Simane Peninsula and Nanao Bay on the Japan-Sea coast. The specimens from the last locality show a very peculiar appearance of the seminal vesicle, which I will describe in a future paper.

As regards the taxonomy of the chaetognaths, there remain several important points to be cleared up. First, the coastal water forms should be more crucially examined. Some new species may be found in the coastal or inlet waters of parts of the world other than Europe and East Asia. Second, a detailed comparative study between closely allied species should be carried out; for instance, *S. ferox* and *S. robusta*, *S. neglecta* and *S. oceanica*, the forms belonging to *S. serratodentata*-group, especially *S. crassa* and its allies, *S. c.* f. *naikaiensis*, *S. delicata* and *S. tumida*. Statistical studies and autecological observations are desirable. Third, the variation according to environmental differences should be worked out. Several species attain a larger size in cold waters than in warm waters. For instance, *S. serratodentata* matures in warm waters when it becomes 12 mm long, while it may reach 17 mm in cold waters. *S. s. atlantica* f. *tasmanica*, a cold water form?, is said to become as long as 20 mm (Thomson 1947). Individuals of *S. bedoti* named f. *minor* by Tokioka (1942) living in tropical waters are small, less than 11 mm in body length, while the individuals collected from the deep waters of the Yellow Sea are as large as 30 mm in length. The same tendency may be found in some other species as well. Crucial studies on this line will contribute much to the knowledge of the interrelationship of the *S. crassa* group.

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